

# Six new species of South African Thysanoptera, with statistical analyses of measurements\*

by

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## PREFACE.

It is surprising how many insects can be found on a relatively small piece of ground. Most of the thrips mentioned in this thesis, as well as about 30 other species of thrips which have not yet been finally identified and are therefore not included in this paper, were taken on a property about ten acres in extent in one of the suburbs of Pretoria. The property is situated at the foot of a hill facing North and the few shrubs, grasses and trees are sparsely distributed

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on the stony slope, the level stretch being covered by a few species of grasses. As the climate is fairly dry, with a rainfall of about 25 inches per annum, the sunbaked vegetation would hardly appear to be suitable to support so many small living creatures, yet thrips can be found here throughout the year.

Six new South African species of Thysanoptera of which the types are in the authors collection are described in this paper and new records of eight previously described species are given. A specific character is also statistically analysed to show the chances of intergradation of two different distribution ranges.

The aim of the statistical analysis is to stress the need of applying elementary statistical methods, especially where large series of specimens are available. It is hoped that this analysis of a representative example of a character, probably just specifically significant, illustrates the possibility of intergradation between specific characters as soon as large series of specimens are measured.

The systematist is faced with a new problem when applying statistics to the separation of one species from another. Statistical significance is based on obtained differences that are probably of a higher magnitude than could be obtained from parallel samples of the same population. The effects of variations in temperature, humidity, food, etc., can cause differences in parallel populations that are statistically significant. An insect population from grass growing on an open field and living under dry and warm conditions, would probably differ statistically, though still belonging to the same species, from a population living on grass growing along a river bank in the shade of trees. A difference that can be proved to be caused by physical factors acting on one or two successive generations cannot be used in separating species. But the difficulty lies in proving that such a difference is due to physical factors. The systematist working with dead material can only postulate theories along these lines as working hypotheses.

To be able to classify populations into two species, they must differ far enough to show a very low probability of intergradation of their normal curves. The statistical analysis in this paper demonstrates this difficulty. The character chosen as an example probably shows sufficient difference to be regarded as a specific character, but gives slight intergradation of the frequency distribution curves.

Among the published papers found by the writer, dealing with the application of statistics to systematic work, only the paper by F. H. Frost\* gave a method to separate species. The method is the one in general use in statistical significance tests, namely the *t* test. In the example used by Frost the two populations showed a strong overlap of ranges. *Parapavo californicus* ( $M = 10.7972$ ,  $s = 0.3772$ ) was compared with *Meleagris gallopovo* ( $M = 10.1445$ ,  $s = 0.4138$ )

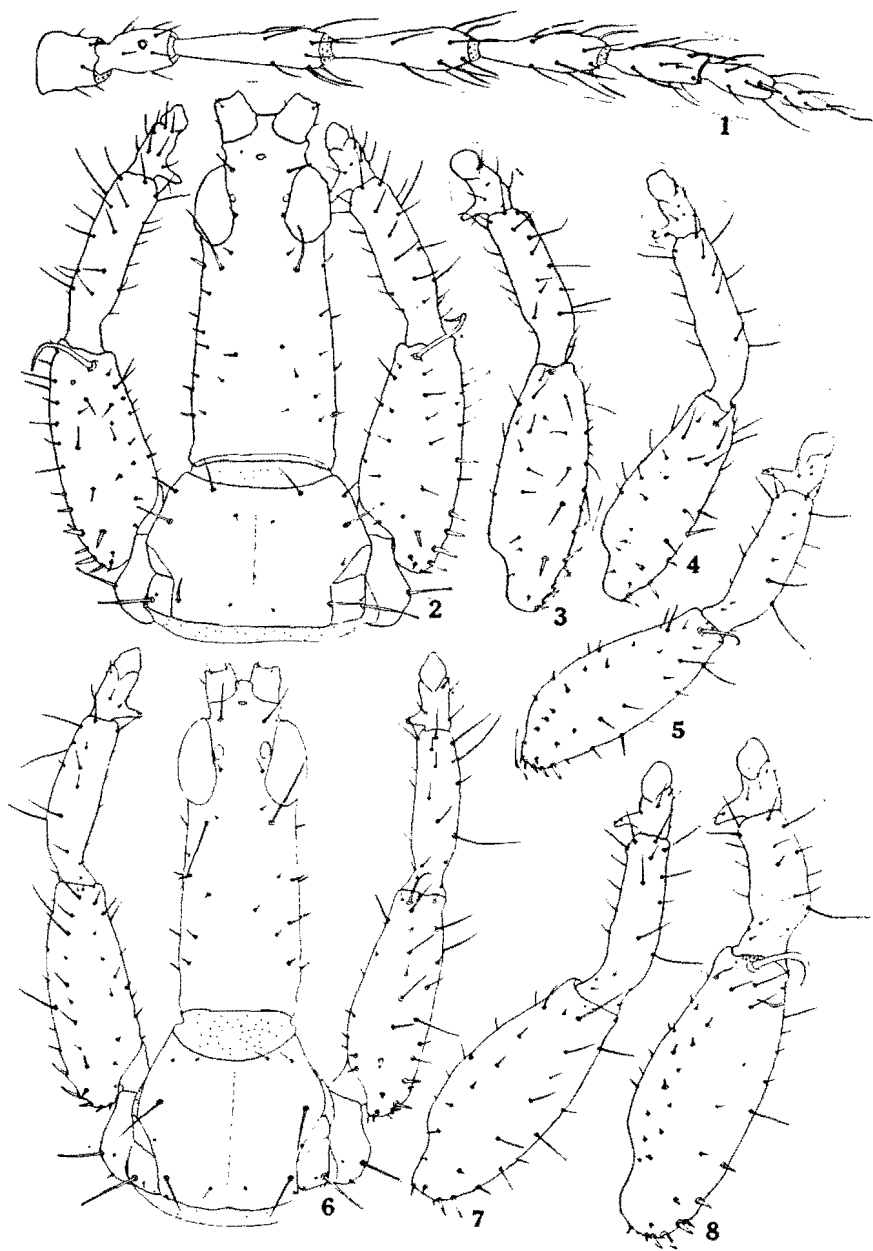
\* Frost, F. H. Statistical identification as applied to *Parapavo* Univ. Calif. Publ. 1927, Bull. Dept. Geol. Sci. Vol. 17, No. 1, pp. 1-62, plates 1-13.

and was found to be not identical. As stressed above, the ranges of frequency distribution should not overlap too strongly because of the difficulty in classing single specimens as belonging to the one or other population and because differences in characters showing a strong overlap may have been caused by physical factors and may not necessarily be of specific importance.

***Elaphrothrips medius* sp.n. (Figs. 1—4, 9, 10).**

*Male* (brachypterous). Length about 2.75 — 3.40 mm. General colour blackish brown. Head dark brown at the base, becoming darker anteriorly, black between the eyes and on the projection in front of the eyes. Antennal segment i uniformly dark brown; ii dark brown at base and along inner margin, paler apically and laterally; iii pale brownish yellow, gradually shading to a light brown towards the apex, iv light brown at base shading to dark brown towards the apex; v — viii dark brown. Thorax almost black. Abdomen almost black, darker than the basal half of the head. In some specimens the seven apical segments are a shade darker than the basal three but these are nevertheless darker than the basal half of the head. All femora and tibiae dark brown, the trochanters brownish yellow; the joints and the tarsi are paler than the femora and tibiae. The spines on the outer basal margin of the fore femora as well as the coxals and the "sickle-shaped" spine when present, yellowish brown. All other major setae and spines on the head and prothorax brownish yellow. Setae on the abdominal segments ii — viii pale; those on ix slightly darker. Terminal tube setae with brown bases.

Head: about 2.25 — 2.65 times as long as width across eyes and about 2.28 times as long as greatest width across the cheeks; broadest in basal third, narrowed behind eyes and in front of basal collar; head projection in front of the eyes about 0.55 — 0.61 times as long as wide. Cheeks flaring to the eyes, their length about twice the least width of the head behind the eyes, set with about 6 or 7 spines, the anterior pair longest, about  $38\mu$  long, bluntly pointed. Surface of head in basal tenth with fine transverse striations. Inter-ocular setae bluntly pointed, about  $47 - 63\mu$  long. Post-ocular setae pointed, weak, about  $30 - 38\mu$  long. Postocular setae pointed, about  $105 - 135\mu$  long,  $97 - 114\mu$  apart and  $21 - 35\mu$  from posterior margin of eyes. Dorsocephalic setae weakly developed, about  $25 - 32\mu$  long,  $63 - 76\mu$  apart and about  $147 - 158\mu$  from posterior margin of eyes. Eyes rounded and protruding, slightly flattened posteriorly; dorsal length about 1.17 times the ventral length. Head about 4.3 times the length of the eyes dorsally, the eyes about  $110 - 120\mu$  long dorsally,  $55 - 59\mu$  wide, and their interval about  $71 - 85\mu$ . The posterior ocelli are about  $59 - 72\mu$  apart, the anterior and posterior ocelli about  $59 - 64\mu$  apart. Antennae about 1.57 times the length of the head, segments iii about 1.10 — 1.25 times as long as iv and segment iv about 1.08 — 1.20 times as long as v. Sense cones: iii, 1 — 1; iv,



2 — 2; v, 1 — 1 (+ 1); vi, 1 — 0 (+ 1); vii, one on dorsum. The outer sense cone on segment iii about 57 — 60 $\mu$  long. Mouth cone broadly rounded at apex, reaching slightly beyond the middle of the prosternum, extending about 135 — 143 $\mu$  beyond the posterior dorsal margin of the head.

Thorax: length of prothorax about 0.38 times the length of the head and (including the coxae) about 2.17 times as wide as long. Prothorax very faintly sculptured over its dorsal surface with slightly roughened areas at the anterior and posterior ends of the median thickening. Usual major setae present, with pale rounded tips, their measurements in  $\mu$  being as follows: antero-marginals about 36 — 47, antero-angulars 38 — 63; mid-laterals 64 — 71; epimerals 85 — 106; postero-marginals about 72; coxals 57 — 72. Fore legs enlarged, the measurements in  $\mu$  as follows: femur, length about 336 — 347, width about 126; tibia, length about 273, width about 63; tarsus, width about 33—42, tarsal tooth, length about 29—42 $\mu$ , slightly curved backwards. Spines on fore femur bluntly pointed, the longest spines at the outer hind angle about 38—47 $\mu$  long. Four of the males have the "sickle-shaped" spine well developed, on four it is weakly developed and the remaining seven have no sickle-shaped spine. Middle and hind legs normal. The pterothorax is slightly broader than the prothorax (1.06 times including the coxae).

Abdomen: widest at about segment iii where it is about as wide as the pterothorax. Major setae on segments ii — viii with rounded tips, those on segment ix and on the tube, pointed. Terminal tube setae about 284 — 306 $\mu$  long. The longest setae on segment ix longer than the tube, about 347 — 368 $\mu$  long (tube length about 296 $\mu$ ). Tube length about 2.30 — 2.85 times its greatest basal width, this about 2.27 — 3.12 times the apical width. Tube length about 0.50 — 0.62 times the length of the head.

*Measurements of holotype* (brachypterous male, Transvaal, Pretoria, 3-vi-1946, in dry basal grass tufts), in  $\mu$ . Length (distended) 3,200; head: length 515, width across eyes 205, least width behind eyes 177, greatest width across cheeks 215, width across basal collar

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*Elaphrothrips medius* sp.n.,

Fig. 1. ♀ paratype (brachypterous), right antenna.

Fig. 2. ♂ holotype, head and prothorax.

Figs. 3 & 4. ♂ paratypes, fore-legs showing variations in development of the sickle-shaped spine.

*Elaphrothrips drepanifer* (Faure),

Figs. 5, 7 & 8. ♂ fore-legs showing variations in the development of the sickle-shaped spine.

Fig. 6. ♂ head and prothorax: note variation in development of sickle-shaped spines.

218, least width near base 207. Head-process: length 76, width 131, least width near base 114. Eyes: dorsal length 120, width 59, interval 83; ventral length 105, width 47, interval 105. Ocelli: posterior, interval 67; their distance from median ocellus 63. Postocular setae: length 106, interval 101, distance from eyes 32. Interocellar setae: length 47, interval 76. Dorsocephalic setae: length 26, interval 63, distance from eyes 158. Mouth cone: length beyond dorsum of head 135. Prothorax: length of pronotum 203, width inclusive of coxae 428. Setae: antero-marginal 47, antero-angular 51, midlateral 64, epimeral 85, postero-marginal 72, coxal 63. Mesothorax: width across anterior angles 393. Metathorax: greatest width of posterior part 351. Abdomen: greatest width 400. Tube: length 296, greatest subbasal width 110, least apical width 38; longest setae on segment ix 368; longest terminal tube setae 304. Sickie-shaped spine on fore femur well developed in holotype.

Antenna: total length 736,

segments	i	ii	iii	iv	v	vi	vii	viii
length	63	71	152	122	101	84	63	52
width	63	38	36	40	36	31	26	19

*Female* (brachypterous). Length about 2.8 — 3.8 mm. Colour as in male with the following exceptions: Antennal segment iii ochreous yellow in the basal half, gradually shading to very light brownish yellow at the apex; iv varies from yellowish brown to dark brown in the basal half, the apical half dark brown. All major spines and setae on the head and prothorax brownish yellow. In some females the tergum just above the hind coxae is paler than the surrounding area, and a shade lighter than the posterior part of the head.

Structure in female not markedly different from male except as noted in the following description.

Head: broader, about 2.05 — 2.60 times as long as width across eyes; head projection about 0.51 — 0.63 times as long as wide. Cheeks more dilated, head about twice as long as greatest width across cheeks, cheeks about 1.7 times as long as least width of head behind eyes. Interocellar setae pointed, about 60 — 70 $\mu$  long. Dorsocephalic setae about 33 — 36 $\mu$  long and about 118 — 150 $\mu$  from the posterior margin of eyes. Head about 3.8 — 4.5 the length of the eyes dorsally, the eye about 101 — 127 $\mu$  long and about 56 — 61 $\mu$  wide; the interval between the eyes about 80 — 88 $\mu$ . Antenna about 1.6 — 1.7 times the length of the head. The outer sense cone on segment iii 53 $\mu$  long. Mouth cone extending about 135 — 169 $\mu$  beyond the posterior dorsal margin of the head.

Thorax: dorsal length of prothorax about 0.41 the length of the head and about 2.08 — 2.20 times as wide (including the coxae) as long. Setae: antero-marginals 37 — 42 $\mu$ ; midlaterals 73 — 98 $\mu$ ; epimerals about 114 — 118 $\mu$ ; postero-marginals 84 — 122 $\mu$ . Fore

femur width about  $112\mu$ . Fore tibia about  $274 - 294\mu$  long. Sickleshaped spine absent. Tarsus about  $50\mu$  wide. Tarsal tooth absent to very weakly developed (about  $12\mu$  long). Longest spines on outer hind angle of fore femur about  $33 - 37\mu$  long. Pterothorax about  $1.11 - 1.50$  times wider than the width of the prothorax.

Abdomen: widest at about segment iii (about  $505 - 610\mu$ ); about  $1.2$  times as wide as the pterothorax. Terminal tube setae about  $273 - 358\mu$  long; the longest setae on segment ix about  $390\mu$  long. Tube about  $366\mu$  long. Tube length about  $2.45 - 3.00$  times its greatest subbasal width, this about  $1.93 - 2.00$  times the apical width. Tube length about  $0.65 - 0.83$  the length of the head.

*Measurements of allotype* (brachypterous female, Transvaal, Pretoria, 3-vi-1946, in dry basal grass tufts) in  $\mu$ . Length (distended)  $3,000$ . Head: length  $458$ , width across eyes  $206$ , least width behind eyes  $180$ , greatest width across cheeks  $228$ , width across basal collar  $217$ , least width near base  $207$ . Head-process: length  $72$ , width  $127$ , least width near base  $110$ . Eyes: dorsal length  $114$ , width  $56$ , interval  $88$ ; ventral length  $102$ , width  $48$ , interval  $101$ . Ocelli: posterior, interval  $67$ ; their distance from median ocellus  $55$ . Postocular setae: length  $135$ , interval  $114$ , distance from eyes  $21$ . Interocellar setae: length  $67$ , interval  $71$ . Dorsocephalic setae: length  $36$ , interval  $66$ , distance from eyes  $118$ . Mouth-cone length beyond posterior dorsal margin of head  $169$ . Prothorax: length of pronotum  $190$ , width (inclusive of coxae)  $414$ . Setae: antero-marginal  $42$ ; antero-angular  $51$ ; midlateral  $73$ ; epimeral  $118$ ; postero-marginal  $84$ ; coxal  $67$ . Mesothorax: width across anterior angles  $423$ . Metathorax: greatest width of posterior part  $406$ . Abdomen: greatest width  $505$ . Tube: length  $368$ , greatest subbasal width  $127$ , least apical width  $38$ . Longest setae on segment ix  $40$ , longest terminal tube setae  $358$ .

Antenna: total length  $768$ ,

segments	i	ii	iii	iv	v	vi	vii	viii
length	47	63	156	135	118	97	71	63
width	57	40	38	41	38	30	26	17

*Female* (macropterous). Length  $2.7$  mm. Colour as in brachypterous female with the following exceptions: segment iii of antenna is slightly darker, as in male. The trochanters are yellowish brown, darker than in both brachypterous males and females. The fore wings are clear, slightly yellowish basally, darker longitudinal vittae absent.

Structure not markedly different from the brachypterous female. Fore wings: length  $1.3$  mm.; subbasal setae ii  $55\mu$ , iii  $80\mu$ , about  $20$  duplicated cilia present.

Described from a total of  $15$  brachypterous males,  $62$  brachypterous females and  $2$  macropterous females. One male (+)\* was taken at Pretoria on *Nidorella hottentotica* D.C. var. *lanata*, 1-i-1946

(E. K. H.). 4 males (+), 4 males ( $\pm$ ),\* 5 males (—),\*, 61 brachypterous females and 1 macropterous female were taken at Pretoria in dense, dry, basal grass tufts of various short grasses by means of an "Auslese Apparat", 3-vi-1946 (E. K. H.). The remaining 2 males (—), 1 brachypterous female and 1 macropterous female were taken at Pretoria in dense, dry, basal grass tufts of various short grasses by the same method, 24-viii-1947 (E. K. H.). All these 79 specimens are mounted on slides.

Judging by the conditions found in *Elaphrothrips medius*, it appears as though the "sickle-shaped" spine on the fore femur of the males should be used with caution as a specific character in this genus, since it is present in some males and absent in others (see figs. 2, 3 and 4). Hood has also found this variation in the development of the sickle-shaped spine where large series of *Elaphrothrips* were examined. (Hood, 1927: Entomologica Americana, Vol. VII. No. 4, pages 238, 239 and 241). Males with the sickle-shaped spine present cannot be separated from males without the sickle-shaped spine in *E. medius* on the grounds of other structural characters, as these characters remain constant throughout the series.

The most striking difference between the new species and *E. drepanifer* (Faure), *E. africana* (Trybom) and *E. congoënsis* Priesner is to be found in the relative lengths of antennal segments vii and viii; vii is longer than viii in the new species and shorter than viii in the other three species. *E. drepanifer* (Faure) also is slightly larger, has the head less swollen near the base as well as a relatively shorter head projection (see Table I). *E. damfi* Hood differs by having the tube length 3.7 times its greatest width near the base. *E. seychellensis* (Bagnall) may be separated by the interocular pair of bristles which are stouter than the postocular pair. In *E. transvaalensis* Jacot-Guillarmod and *E. albospinosus* Moulton, the postocular setae are 184 $\mu$  long whereas in the new species they do not exceed 150 $\mu$ .

The seven species mentioned in this paragraph are those with which the new species might be confused.

### Statistical analysis of measurements.

The males of *E. medius* were too few in number to be worked out separately in Table I in the case of the first four ratios. They were combined with the females in the case of the last ratio and the measurement of the postocular setae since the male and female ranges coincided in these cases.

From Table I it can be seen that the ratio "antenna: length of vii/length of viii" shows the least overlap in the theoretical ranges. The true range of this character shows that in the series measured all specimens could be classed as belonging to either *E. drepanifer*

\* (+) = with sickle-shaped spine, ( $\pm$ ) = with intermediate sickle-shaped spine, (—) = without sickle-shaped spine.



TABLE I.

Statistical constants calculated from measurements and ratios of important characters of *E. Medius* and *E. drepanifer*.

Ratio or measurement	species	sex	n	true range	M	s	theor. range	C.V.	M $\pm$ 2s
Head projections: length/width	<i>E. medius</i>	♀	54	0.51 — 0.63	0.56648	0.02188	0.50 — 0.63	3.87	0.52 — 0.60
	<i>E. drepanifer</i>	♀	34	0.40 — 0.53	0.45853	0.02519	0.38 — 0.54	5.49	0.40 — 0.50
Tube length Head length	<i>E. medius</i>	♀	45	0.65 — 0.83	0.75633	0.03573	0.64 — 0.87	4.72	0.68 — 0.82
	<i>E. drepanifer</i>	♀	34	0.70 — 0.84	0.755292	0.02962	0.66 — 0.85	3.92	0.70 — 0.81
Head: length/width across eyes	<i>E. medius</i>	♀	54	2.05 — 2.60	2.3111	0.1025	2.00 — 2.62	4.48	2.10 — 2.51
	<i>E. drepanifer</i>	♀	34	2.24 — 2.68	2.46353	0.10192	2.15 — 2.77	4.15	2.26 — 2.66
Tube: length basal width	<i>E. medius</i>	♀	45	2.45 — 3.00	2.8005	0.11855	2.45 — 3.15	4.23	2.67 — 3.03
	<i>E. drepanifer</i>	♀	34	2.75 — 3.25	3.0191	0.1038	2.71 — 3.33	3.44	2.81 — 3.22
Postocular setae length in $\mu$	<i>E. medius</i>	♀ + ♂	56	95 — 150	121.5	11.72	85.8 — 156.2	9.65	98 — 145
Antenna: length of vii/length of viii	<i>E. medius</i>	♀ + ♂	71	1.07 — 1.37	1.20331	0.06297	1.01 — 1.39	5.24	1.08 — 1.32
	<i>E. drepanifer</i>	♀ + ♂	40	0.86 — 1.00	0.92425	0.03419	0.821 — 1.027	3.70	0.86 — 0.99

n = total number of specimens measured; M = mean; s = standard deviation; theor. range = theoretical range ( $M \pm 3s$ ) containing 99.73% of the total population; C.V. = coefficient of variation;  $M \pm 2s$  = calculated range containing 95.46% of the total population

TABLE II.

The measurements, classed under the respective characters of *E. medius* from which the constants given in table I were calculated.

Head projection: $\frac{\text{length}}{\text{width}}$					Tube length Head length					Head: $\frac{\text{width}}{\text{width across eyes}}$				
Class	frequency distribution				Class	frequency distribution				Class	frequency distribution			
	♀	♂				♀	♂				♀	♂		
		+	±	—			+	±	—			+	±	—
0.50 — 0.51					0.50 — 0.53					2.05 — 2.10	2			
0.51 — 0.52	1				0.53 — 0.56	1	1			2.10 — 2.15	1			
0.52 — 0.53					0.56 — 0.59				3	2.15 — 2.20	4			
0.53 — 0.54	7				0.59 — 0.62	1	1			2.20 — 2.25	8			
0.54 — 0.55	5				0.62 — 0.65					2.25 — 2.30	8	1		
0.55 — 0.56	4	1			0.65 — 0.68	1				2.30 — 2.35	13			1
0.56 — 0.57	17			1	0.68 — 0.71	2				2.35 — 2.40	8		1	
0.57 — 0.58	3			1	0.71 — 0.74	13				2.40 — 2.45	5	1		
0.58 — 0.59	8	2	1		0.74 — 0.77	13				2.45 — 2.50	4		1	
0.59 — 0.60	7	1			0.77 — 0.80	10				2.50 — 2.55		2	1	2
0.60 — 0.61	1			2	0.80 — 0.83	6				2.55 — 2.60	1			
0.61 — 0.62										2.60 — 2.65			1	
0.62 — 0.63	1													
Total	54		9			45		9			54		11	

Tube: $\frac{\text{length}}{\text{basal width}}$					Postocular setae length in $\mu$					Antenna: $\frac{\text{length of VII}}{\text{length of VIII}}$				
Class	frequency distribution				Class	frequency distribution				Class	frequency distribution			
	♀	♂				♀	♂				♀	♂		
		+	±	—			+	±	—			+	±	—
2.30 — 2.35		1	1		95 — 100	1				1.07 — 1.10	1			
2.35 — 2.40		1	1		100 — 105					1.10 — 1.13	4			1
2.40 — 2.45					105 — 110	4	1		1	1.13 — 1.16	16			1
2.45 — 2.50	1			1	110 — 115	11		1	2	1.16 — 1.19	10	1		
2.50 — 2.55	1			1	115 — 120	7		2	1	1.19 — 1.22	7	1		
2.55 — 2.60	4		1		120 — 125	3				1.22 — 1.25	7	1	1	
2.60 — 2.65	6			1	125 — 130	4		1		1.25 — 1.28	9		2	1
2.65 — 2.70	5				130 — 135	4	2			1.28 — 1.31	2		1	
2.70 — 2.75	2				135 — 140	7				1.31 — 1.34	1	1		1
2.75 — 2.80	7				140 — 145	3				1.34 — 1.37	1			1
2.80 — 2.85	10	1			145 — 150	1								
2.85 — 2.90	3				150 — 155									
2.90 — 2.95	5													
2.95 — 3.00	1													
Total	45		9			45		11			58		13	

+ = with sickle-shaped spine, ± = with intermediate sickle-shaped spine, — = without sickle-shaped spine.

or *E. medius*. The ratio "head projection: length/width" shows an overlap in the theoretical as well as in the true ranges. It therefore seems as if this character cannot be used as a specific character. The probability curves and normal curves were calculated for this character to show that, although there is an overlap, the specimens can be classified into *E. drepanifer* and *E. medius* on the basis of probabilities. The remaining four characters cannot be considered as specific characters since the ranges overlap too strongly.

FIG 9

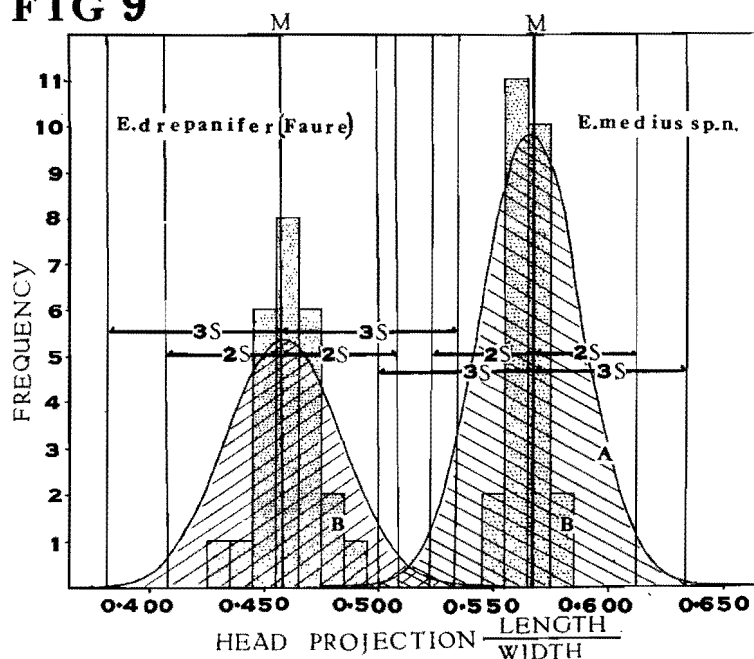


Fig. 9. Frequency distribution curves of *Elaphrothrips drepanifer* (Faure) and *Elaphrothrips medius* sp.n. using "head projection: length/width" as specific character: A: normal frequency distributions; B: frequency histograms of means calculated from groups of five specimens selected at random from the respective series.

It is well known that the fluctuations in a quantitative character can be represented statistically by means of a frequency distribution. When two populations differ in respect of a quantitative character, the frequency distribution must also differ. A specific character has generally been regarded as one in which no intergradation with that of any closely related species exists. In other words, a frequency distribution of measurements of one species should be

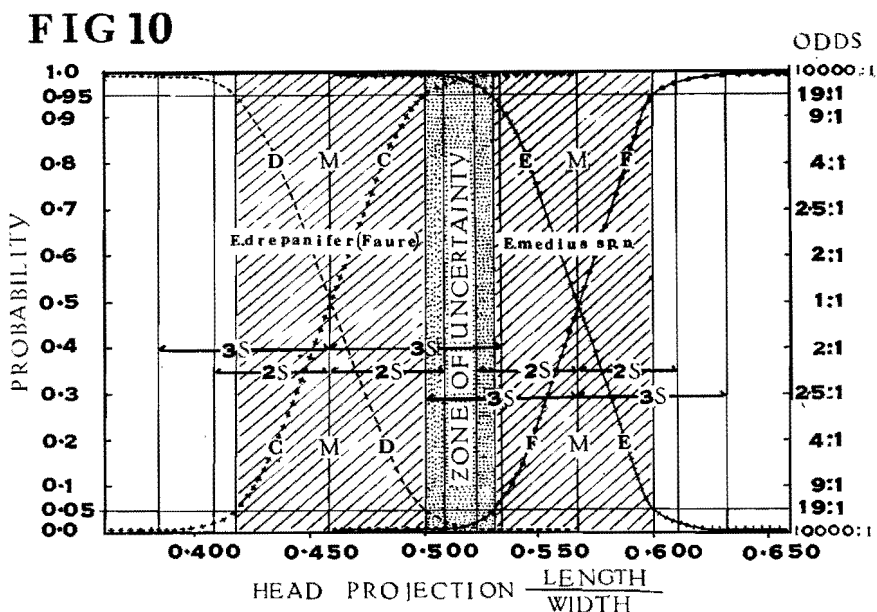


Fig. 10. Curves of probabilities using "head projection: length/width" as specific character: C: improbability of belonging to *E. drepanifer* (Faure); D: probability of belonging to *E. drepanifer* (Faure); E = improbability of belonging to *E. medius* sp.n.; F = probability of belonging to *E. medius* sp.n.

distinctly different from that of a similar distribution of measurements obtained from another species. Theoretically complete separation is impossible but the chances of intergradation become less the greater the difference in characters measured, and the smaller the degree of variation exhibited by the measurements. Probably only very large series of specimens measured will show intergradation, as the chances of a specimen from either population falling in the zone of intergradation are very slight in the case of a character such as "head projection: length/width", as shown below. The chances of intergradation can be examined statistically and expressed in terms of probabilities.

Two sets of measurements (head projection: length/width) were taken from two species *Elaphrothrips drepanifer* (Faure) and *Elaphrothrips medius* sp.n. The normal frequency distribution curves represented by the two sets of measurements are shown in figure 9 from which it is apparent that the distributions differ from each other but at the same time there is some overlapping. That is to say, an individual measurement in the centre of the area where

the two curves overlap has about an equal chance of belonging to either species. In other words there is a degree of intergradation in this area of overlap.

Statistically it is a well-known convention to consider an individual measurement which differs from the population mean by three times the standard deviation or more as not belonging to that population. Using this criterion it may be assumed that any measurement equal to or greater than 0.534 does not represent an individual belonging to *E. drepanifer*, but that it belongs to *E. medius*. Similarly any measurement equal to or less than 0.500 does not belong to *E. medius* but to *E. drepanifer*.

It is also obvious that the limits between which intergradation takes place are 0.500 and 0.534. Any individual with a measurement between these limits cannot be classified on the basis of the above mentioned criterion. The area between 0.500 and 0.534 is referred to as a zone of uncertainty (fig. 10).

A further examination of the zone of uncertainty is shown graphically in figure 10. Probabilities and odds have been calculated for the degree of probability with which an individual in the zone may be classified as belonging to either of the two species. An individual with a measurement lying to the right of the zone has a greater chance of belonging to *E. medius* than one with a measurement lying to the left of the zone. The chances in terms of odds (or in terms of probabilities) may be read off from the vertical axes of the graph.

Table III further explains the reading off of chances as represented graphically in fig. 10.

Deductions from Table III and fig. 10:

- (i) Out of 10,000 individuals belonging to *E. drepanifer*, 485 would measure 0.50 but out of 10,000 individuals belonging to *E. medius*, only 12 would measure 0.50.
- (ii) Out of 10,000 individuals of *E. drepanifer* 197 would measure 0.51.
- (iii) Out of 10,000 individuals of *E. drepanifer* 69 would measure 0.52.
- (iv) Out of 10,000 individuals of *E. drepanifer* 21 would measure 0.53.

Hence it is very unlikely that any of the "uncertain" specimens will be found at all.

This comparison of *E. drepanifer* with *E. medius* demonstrates that although two series may show intergradation of specific characters when large series are measured, they can nevertheless be considered as two species. It is probable that when the differences of twice the standard deviations from the population means of two series do not touch each other, the two populations represent two different species.

TABLE III.

The classification of *E. drepanifer* and *E. medius* based on chances as represented in fig. 10.

Classification	Chances against specimen belonging to <i>E. medius</i>		Single measurement	Chances against specimen belonging to <i>E. drepanifer</i>		Classification
	Odds	P-value		P-value	Odds	
Not <i>E. medius</i>	10,000:1	1.0000	0.4585	0.5000	1:1	<i>E. drepanifer</i>
"	10,000:1	1.0000	0.4600	0.5239	1:1	"
"	10,000:1	1.0000	0.4700	0.6772	2:1	"
"	10,000:1	1.0000	0.4800	0.8051	4:1	"
"	4,999:1	0.9998	0.4900	0.8962	9:1	"
Uncertain: suggesting <i>E. medius</i> ↓	832:1	0.9988	0.5000 (i)	0.9515	20:1	Uncertain: suggesting <i>E. drepanifer</i> ↑
	203:1	0.9951	0.5100 (ii)	0.9803	49:1	
	59:1	0.9834	0.5200 (iii)	0.9931	144:1	
	20:1	0.9525	0.5300 (iv)	0.9979	475:1	
<i>E. medius</i>	8:1	0.8869	0.5400	0.9994	1,666:1	Not <i>E. drepanifer</i>
"	3:1	0.7734	0.5500	0.9999	9,999:1	"
"	2:1	0.6179	0.5600	1.0000	10,000:1	"
"	1:1	0.5000	0.5665	1.0000	10,000:1	"

**Elaphrothrips drepanifer** (Faure) (Figs. 7—10). 1925 (= **Dicaiothrips drepanifer** Faure), S.A. Jour. Nat. Hist. V, p. 162, Pl. XV, figs. 12, 15.

The writer studied 322 specimens of *E. drepanifer* (Faure), all taken at Pretoria during the years 1945 — 1947, and it seems as if two forms of males exist in this species. The two forms can be separated by the presence or absence of the "sickle-shaped" spine on the fore femur. Only the form with the sickle-shaped spine present was mentioned in the original description.

In the series of 162 males collected in 1946 and 1947, the sickle-shaped spine is strongly developed in 54 males, but it varies from very strongly developed to less outstanding. In one male it is weakly developed (fig. 5); it is absent on the left femur and weakly developed on the right femur in one other male (fig. 6). The remaining 106 males of the series have no sickle-shaped spine.

The ratio between males with and males without the sickle-shaped spine seems to vary in different years. In 1946 the majority of males collected had no sickle-shaped spine, whereas in 1947 males with a sickle-shaped spine were in the majority.

The series of males indicates a general positive correlation between the size of the fore-leg and the development of the sickle-shaped spine. Hood also found this to be the case with *Elaphrothrips tuberculatus* (Hood) (March, 1927; *Entomologica Americana*; Vol. VII, No. 4, pp. 239 and 241).

### Statistical analysis of measurements.

Although significant differences have been found between the two male and female series collected in 1946 and 1947 respectively in characters other than the sickle-shaped spine development in the males, the series do not differ sufficiently in any one of these characters to warrant the designation of the two forms as separate varieties. (See Table IV).

The data on the females of the two series are included in Table IV, only where the ratios of the corresponding two female series showed a significant difference. Where no significant difference was found in the ratios of the two female series, the data of both were combined and included in Table I.

From the data given in Table IV one can conclude that the differences found between the two forms of males and females cannot be considered as of specific rank because of the strong overlapping of the distribution ranges for the respective measurements. As a relatively large percentage of intermediate forms are present in all the characters showing a significant difference and since the two series occur in the same locality, they cannot be regarded as subspecies, nor does it seem advisable to apply varietal names to the two series.

TABLE IV.

Statistical constants calculated from ratios of important characters of *E. drepanifer* (Faure) to show the differences that exist between the two series.

Ratio	series	sex	n	true range	M	s	theor. range	C.V.	M $\pm$ 2s
Head projection: length/width	—	♂	31	0.36 — 0.50	0.425967	0.03063	0.33 — 0.52	7.18	0.36 — 0.48
	+	♂	31	0.42 — 0.54	0.49694	0.07775	0.27 — 0.73	15.67	0.34 — 0.64
Tube length Head length	—	♂	31	0.60 — 0.76	0.66676	0.03632	0.55 — 0.78	5.45	0.59 — 0.73
	+	♂	31	0.52 — 0.68	0.61324	0.03372	0.51 — 0.72	5.49	0.54 — 0.68
Head: length/ width across eyes	—	♂	31	2.13 — 2.60	2.40324	0.09132	2.13 — 2.68	3.80	2.22 — 2.58
	+	♂	31	2.36 — 2.80	2.55806	0.0812	2.31 — 2.80	3.17	2.39 — 2.72
Head: length/ width across cheeks	—	♂	31	2.30 — 2.72	2.54096	0.09492	2.25 — 2.83	3.73	2.35 — 2.73
	+	♂	31	2.60 — 2.02	2.81674	0.09846	2.52 — 3.11	3.49	2.62 — 3.00
Tube: length/ basal width	—	♂	31	2.80 — 3.35	3.0411	0.13475	2.63 — 3.45	4.44	2.77 — 3.31
	+	♂	31	2.65 — 3.30	2.984675	0.16230	2.49 — 3.47	5.40	2.66 — 3.30
Tube: basal width apical width	1946	♀	17	1.95 — 2.45	2.20145	0.1030	1.89 — 2.51	4.68	2.00 — 2.40
	1947	♀	17	2.10 — 2.55	2.32206	0.1035	2.01 — 2.63	4.46	2.11 — 2.53
	—	♂	29	1.55 — 2.32	1.9043	0.13735	1.49 — 2.32	7.20	1.63 — 2.17
	+	♂	31	1.75 — 2.20	1.99595	0.08865	1.73 — 2.27	4.44	1.82 — 2.16
Head length	—	♂	31	8.80 — 11.80	10.549375	0.66105	8.57 — 12.53	6.27	9.20 — 11.80
Head projection length	+	♂	31	8.20 — 9.85	8.97675	0.47385	7.75 — 10.39	5.27	8.00 — 9.90



TABLE V.

*The measurements classed under the respective characters of E. drepanifer, from which the constants given in Table I were calculated.*

Head projection: $\frac{\text{length}}{\text{width}}$					Tube length Head length				
Class		frequency distribution				Class		frequency distribution	
		♂		♀				♂	
		—	+	46	47			—	+
0.360 — 0.370	1					0.52 — 0.54	1		
0.370 — 0.380	2					0.54 — 0.56	1		
0.380 — 0.390	1					0.56 — 0.58	3		
0.390 — 0.400	3					0.58 — 0.60	5		
0.400 — 0.410	2				1	0.60 — 0.62	3	7	
0.410 — 0.420	4				1	0.62 — 0.64	4	8	
0.420 — 0.430	3	1	1	2		0.64 — 0.66	8	3	
0.430 — 0.440	5			3	1	0.66 — 0.68	6	3	
0.440 — 0.450	3			1		0.68 — 0.70	5		
0.450 — 0.460	3	2	5	2		0.70 — 0.72	1		2 3
0.460 — 0.470	2	5	4	3		0.72 — 0.74	3		2 3
0.470 — 0.480	1	1	2	3		0.74 — 0.76	1		4 5
0.480 — 0.490		2		2		0.76 — 0.78			6 4
0.490 — 0.500	1	2	1			0.78 — 0.80			2
0.500 — 0.510		6		1		0.80 — 0.82			1 1
0.510 — 0.520		5				0.82 — 0.84			1
0.520 — 0.530		4		1					
0.530 — 0.540		3							
Total		31	31	17	17				

46 = Females collected in 1946,

47 = Females collected in 1947,

For further symbols see Table I and II.

TABLE VI.

*The measurements classed under the respective characters of E. drepanifer, from which the constants given in Table I were calculated.*

Head: $\frac{\text{length}}{\text{width across eyes}}$					Head: $\frac{\text{length}}{\text{width across cheeks}}$				
Class	frequency distribution				Class	frequency distribution			
	♂		♀			♂		♀	
	—	+	46	47		—	+	46	47
2.12 — 2.16	1				2.06 — 2.12				1
2.16 — 2.20					2.12 — 2.18				
2.20 — 2.24	1				2.18 — 2.24				1
2.24 — 2.28	1			1	2.24 — 2.30				
2.28 — 2.32	1				2.30 — 2.36	1			
2.32 — 2.36	4		2	1	2.36 — 2.42	3		4	2
2.36 — 2.40	5	1	4	3	2.42 — 2.48	4		4	1
2.40 — 2.44	9		2	3	2.48 — 2.54	7		3	2
2.44 — 2.48	2	5	2	1	2.54 — 2.60	6		4	2
2.48 — 2.52	5	4	3	3	2.60 — 2.66	7	2		4
2.52 — 2.56	1	4	1	1	2.66 — 2.72	3	4	2	2
2.56 — 2.60	1	10	2	2	2.72 — 2.78		3		1
2.60 — 2.64		4	1		2.78 — 2.84		10		
2.64 — 2.68				2	2.84 — 2.90		7		1
2.68 — 2.72		2			2.90 — 2.96		1		
2.72 — 2.76					2.96 — 3.02		4		
2.76 — 2.80		1							
Total	31	31	17	17		31	31	17	17

TABLE VII.

*The measurements classed under the respective characters of E. drepanifer, from which the constants given in Table I were calculated.*

Tube: $\frac{\text{length}}{\text{basal width}}$					Tube: $\frac{\text{basal width}}{\text{apical width}}$				
Class	frequency distribution				Class	frequency distribution			
	♂		♀			♂		♀	
	—	+	46	47		—	+	46	47
2.65 — 2.70		2			1.55 — 1.60	1			
2.70 — 2.75					1.60 — 1.65				
2.75 — 2.80		4	1		1.65 — 1.70	1			
2.80 — 2.85	3	2	3	2	1.70 — 1.75	1			
2.85 — 2.90	2			1	1.75 — 1.80	3	1		
2.90 — 2.95	3	3	2	7	1.80 — 1.85	2	1		
2.95 — 3.00	2	4	1	3	1.85 — 1.90	6	2		
3.00 — 3.05	9	7	2	2	1.90 — 1.95	6	4		
3.05 — 3.10	4	1	4	1	1.95 — 2.00	1	5	1	
3.10 — 3.15	1	4	2		2.00 — 2.05	7	14		
3.15 — 3.20	3	1	2		2.05 — 2.10		1	1	
3.20 — 3.25	1			1	2.10 — 2.15			4	2
3.25 — 3.30	1	3			2.15 — 2.20		3	2	1
3.30 — 3.35	2				2.20 — 2.25			3	
					2.25 — 2.30			4	2
					2.30 — 2.35	1		1	6
					2.35 — 2.40				2
					2.40 — 2.45			1	3
					2.45 — 2.50				
					2.50 — 2.55				1
Total	31	31	17	17		29	31	17	17

TABLE VIII

*The measurements classed under the respective characters of E. drepanifer, from which the constants given in Table I were calculated.*

Head length					Antenna: length of VII						
Head projection length					length of VIII						
Class		frequency distribution				Class		frequency distribution			
		♂		♀				♂		♀	
		—	+	46	47			—	+	46	47
8.20 — 8.35			2		1	0.860 — 0.870					1
8.35 — 8.50			5			0.870 — 0.880				1	
8.50 — 8.65			3		1	0.880 — 0.890			1	2	2
8.65 — 8.80			5	1	1	0.890 — 0.900			2		1
8.80 — 8.95		1	1		3	0.900 — 0.910		1	2	1	2
8.95 — 9.10			1		1	0.910 — 0.920		1			
9.10 — 9.25			4	1	2	0.920 — 0.930		2		1	
9.25 — 9.40			1	1	2	0.930 — 0.940		2	2	2	2
9.40 — 9.55			4	3	2	0.940 — 0.950			1	1	1
9.55 — 9.70			4	2	1	0.950 — 0.960		2			1
9.70 — 9.85		2	1	2		0.960 — 0.970		2	2	1	
9.85 — 10.00		2				0.970 — 0.980					
10.00 — 10.15		5		7	1	0.980 — 0.990					
10.15 — 10.30		3				0.990 — 1.000				1	
10.30 — 10.45		3			1						
10.45 — 10.60		2									
10.60 — 10.75		3			1						
10.75 — 10.90		1									
10.90 — 11.05		1									
11.05 — 11.20		1									
11.20 — 11.35		1									
11.35 — 11.50		2									
11.50 — 11.65		3									
11.65 — 11.80		1									
Total		31	31	17	17			10	10	10	10

The specimens were collected by the writer at Pretoria in the suburb of Villieria on a property of about 10 acres in extent, as follows:

23-xii-1945, 2 females (2); 24-ii-1946, 10 males + sickle (8), 87 males — sickle (66) and 89 females (66); 15-iv-1947, 41 males + sickle (37), 2 males intermediate (2), 16 males — sickle (3) and 66 females (17) on *Hyparrhenia hirta* (L.) Stapf.

2-ii-1946, 2 males — sickle (2); 12-iii-1947, 3 males + sickle (1), 1 male — sickle (1) and 3 females (1) on *Chloris virgata* Sw.

The figures in parentheses are the number of specimens mounted on slides.

**Elaphrothrips orangiae** Jacot-Guillardmod. Publ. Univ. Pta. II: Nat. Sci. No. 3, p. 31, Pl. IV, figs. 23, 24.

Only the brachypterous male and female have been described. Macropterous females were found in the *E. orangiae* series collected by the writer at Pretoria on 1-i-1946 and 16-ii-1947 on *Bignonia Tweediana* Ldl.

*Female* (macropterous): Colour as in brachypterous female. The fore wings are clear, slightly yellowish basally; darker longitudinal vittae absent.

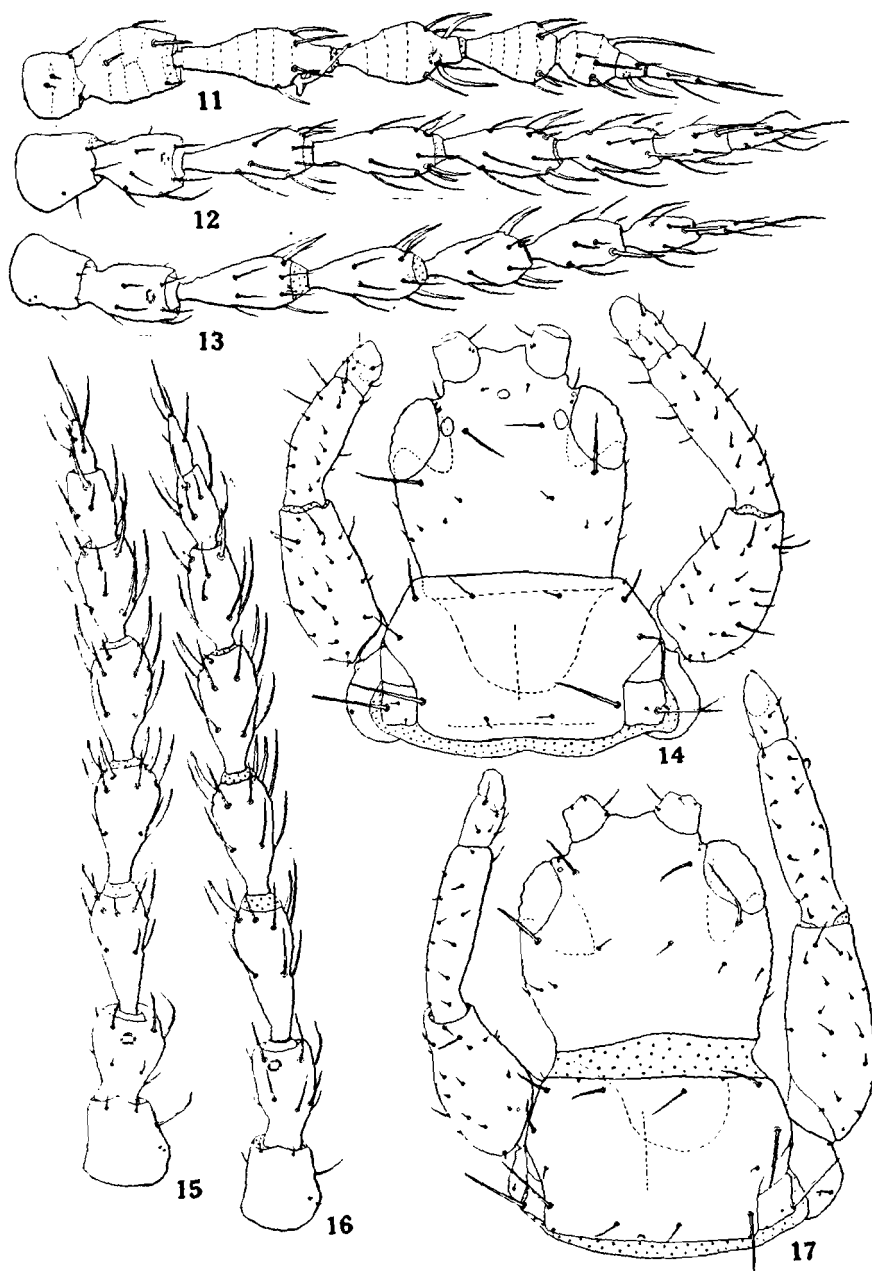
Structure as in brachypterous female excepting that the macropterous form is larger: about 3.6 mm. whereas the brachypterous females taken in the same locality are about 2.8 mm. long. The head also seems narrower, the head length about 2.5 — 2.8 the width across the eyes. Fore wings: length about 1.3 mm.; subbasal setae in  $\mu = i$ . about 85 — 90,  $ii$ . about 122 and  $iii$ . about 176 — 186. About 26 — 30 duplicated cilia present.

All the males collected are brachypterous.

The specimens were collected by the writer at Pretoria on a creeper, *Bignonia Tweediana* Ldl. as follows: 1-i-1946, 15 brachypterous females, 6 macropterous females and 24 brachypterous males. All these specimens are mounted on slides. 16-ii-1947, 30 brachypterous females, 9 macropterous females and 16 brachypterous males. One brachypterous female was collected by the writer on *Pennisetum clandestinum* Hochst., Pretoria, 11-v-1946.

**Bolothrips similis** sp.n. (Figs. 12 and 14).

*Female* (macropterous). Length about 1.6 mm. (about 2.2 mm. fully distended). Colour: Head, thorax and abdomen brown, the thorax and first five abdominal segments sometimes yellowish brown and paler than the head and remaining abdominal segments; tube darkest, almost black in darker specimens. All legs yellow to brownish yellow. Eyes yellow, with red underlying tissue (when studied over black paper). All setae light brown. Antennae:  $i$  yellow;  $ii$  yellow, tinged with grey, slightly darker than  $i$ ;  $iii$



yellow, shaded with grey-brown in apical fifth; iv yellow in basal half, remainder greyish-brown; v yellow in basal third with remainder greyish-brown; vi, vii and viii dark greyish-brown; vi sometimes paler basally. Fore-wings: grey, a darker longitudinal line running along the middle from the basal fifth to about the apical fifth of wing. This dark stripe darkest in the median portion of the wing. A pale stripe, clearest in middle third and absent towards apex, cephalad of the dark stripe.

Head: about 0.9 — 1.1 times as long as wide, widest across the eyes (about 0.22 mm.) slightly narrower behind the eyes, cheeks almost straight, converging evenly towards base (basal width about 0.17 — 0.20 mm.). Head produced in front of eyes, extreme tip about  $38\mu$  from line through anterior margin of eyes; distance from eye to margin of antennal insertion about 19 —  $21\mu$ . Eyes small, scarcely protruding, coarsely faceted, with about 7 facets on outer dorsal margin; smallest dorsal interval about 114 —  $126\mu$ , dorsal anterior interval about 135 —  $143\mu$ ; eyes produced ventrally into a blunt point, ventral length varying from equal to the dorsal length to about 1.3 times the dorsal eye length.\* Ocelli present, about  $13\mu$  in diameter; posterior pair about  $91\mu$  apart and interval between posterior and anterior ocelli about  $46\mu$ . Postoculars about 63 —  $84\mu$  in length, about 152 —  $170\mu$  apart, bluntly pointed but not knobbed, situated about  $6\mu$  from eyes; interocellar setae about 42 —  $50\mu$  long. Ventrally a pair of setae about 59 —  $95\mu$  long, situated about 12 —  $21\mu$  from base of antennae, and another pair about 75 —  $92\mu$  in length, about  $16\mu$  from anterior margin of mouth-cone. Head with cheeks minutely serrate and posterior margin faintly sculptured.

\* This variation in the ventral length of the eyes is not due to the position in which the insects are mounted on the slides.

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*Hercinothrips tenuis* sp.n.,

Fig. 11. ♀ paratype, right antenna.

*Bolothrips similis* sp.n.,

Fig. 12. ♀ paratype (apterous), left antenna.

Fig. 14. ♀ holotype (macropterous), head and prothorax.

*Bolothrips subulatus* sp.n.,

Fig. 13. ♀ paratype (deälated), left antenna.

*Bolothrips dimidiatus* (Hood) (Cape, Stellenbosch, 10-x-1946, E. K. H. on *Avena fatua* L.),

Fig. 15. ♀ (apterous) left antenna.

Fig. 17. ♀ (apterous) head and prothorax.

*Bolothrips varius* sp.n.,

Fig. 16. ♀ (apterous) left antenna.

First abdominal tergite finely striate; rest of body practically without sculpturing.

Antennae (fig. 12): Sense cones: iii, 1 — 1; iv, 2 — 2; v, 1 — 1 (+ 1); vi, 1 — 0 (+ 1); vii, 0 — 1. Mouth-cones: length from dorsal posterior margin of head about 110 — 126 $\mu$ ; maxillary palpi: total length about 51 — 55 $\mu$ , i about 10, ii about 38 — 42 $\mu$ .

Prothorax: about 0.64 times as long as head and about 2.00 — 2.15 times as wide (including coxae) as long, smooth. Major setae: antero-agulars about 25 — 45 $\mu$ ; antero-marginals about 20 — 43 $\mu$ ; mid-laterals about 33 — 63 $\mu$ ; epimerals about 50 — 70 $\mu$ ; postero-marginals about 58 — 72 $\mu$ ; coxals about 20 — 35 $\mu$ ; all the major setae bluntly pointed. Pterothorax about 1.2 times broader than prothorax. Legs normal, fore tarsi unarmed. Longest subapical setae on outer margin of hind tibia about 63 — 72 $\mu$ , those on inner margin about 25 — 35 $\mu$ . Longest setae on fore, middle and hind femora near base on inner side and about 63 — 80 $\mu$  long. Fore-wings: about 884 — 905 $\mu$  long, about 84 — 90 $\mu$  wide, the width more or less equal along the whole length of the wing, apical quarter of wing bent slightly forewards; subbasal wing setae: i about 34 — 42 $\mu$ , ii about 47 — 53 $\mu$  and iii about 51 — 67 $\mu$ .

Abdomen: about 2.0 — 2.4 times as wide as length of head; tube: about 0.60 — 0.76 times as long as the head, its length about 1.62 — 1.75 times its basal width, the latter about twice the apical width; sides parallel in basal sixth, thence sloping evenly to apex; terminal tube setae about 98 — 110 $\mu$  long. Longest setae on segment ix about 100 — 110 $\mu$  in length. Measurements of the abdominal setae are not included, as they vary in length and do not differ markedly from those of other *Bolothrips* species of more or less the same size.

*Measurements of holotype*: (macropterous female, Transvaal, Pretoria, 13-ii-1946 on *Panicum maximum* Jacq.) in  $\mu$ . Length 1,789; head: total length 220, width across eyes 220, behind eyes 212, at base 177; head projection length 38, width 118. Setae: postoculars 68; interocellars 47. Prothorax: length 140, width (including coxae) 318; setae: epimeral 63; coxal 29; postero-marginal 64; midlateral 30; antero-angular 34; antero-marginal 25. Pterothorax: width 372. Abdomen: length 1,115, width 463; tube: length 156, width at base 84, width at apex 42, setae 98.

Antenna: length 463,

segments	i	ii	iii	iv	v	vi	vii	viii
length	38	55	72	72	68	63	46	35
width	46	37	32	33	31	30	24	13

*Female* (apterous). Length about 1,400 — 1,700 $\mu$  up to 2,200 $\mu$  distended. Colour: abdomen darker than in macropterous form, almost black in some specimens. Antennae with segment vi not as dark as vii and viii. Legs and antennal segments generally darker yellow.



Structure practically as in macropterous female. Ocelli absent; pterothorax about 0.94 — 1.10 times as wide as the prothorax.

*Male* (apterous). Length about 0.98 — 1.58 mm. Antennae and legs coloured as in macropterous female. Head and thorax yellowish-brown. Abdomen dark brown (almost black) as in apterous female. Proportions practically as in female. Fore femora and tibiae enlarged and tarsi armed with a tooth, the development however varying: femur length about 160 — 250 $\mu$ , width about 71 — 122 $\mu$ ; tibia length about 135 — 190 $\mu$ , width about 42 — 55 $\mu$ ; tarsus length about 59 — 76 $\mu$ , width about 29 — 34 $\mu$ , tooth length about 16 — 38 $\mu$ .

*Measurements of allotype* (apterous male, Transvaal, Pretoria, 9-xii-1945, on lucern) in  $\mu$ . Length 1,684 (distended); head: total length 206, width across eyes 206, behind eyes 202, at base 171; setae: postocular 68, distance between 143; interocellar 42. Prothorax: length 198, width (including the coxae) 326; setae: epimeral 60; coxal 26; postero-marginal 76; mid-lateral 52; antero-angular 29; antero-marginal 34. Pterothorax width 296. Abdomen: length 1,126 (distended), width 408; setae on segment ix 88; tube: length 148, width at base 88; at apex 43; setae: 122.

Antenna: length 430.

segments	i	ii	iii	iv	v	vi	vii	viii
length	44	51	67	59	60	59	42	34
width	46	34	32	32	32	30	24	13

This new species is very close in general colour and form to *B. dimidiatus* (Hood) of which I have been able to study a macropterous female from Australia in the collection of the University of Pretoria, determined by Dr. J. D. Hood, in addition to the series of specimens from the Cape referred to below (see figs. 15 and 17).

The cheeks in *B. similis* converge from the eyes to the base so that the head is broadest across the eyes. In *dimidiatus* the cheeks bulge behind the eyes before converging towards the base, so that the head is broadest across the cheeks. The basal head width in *dimidiatus* is also about as wide as the postoculars are apart. In *similis* the basal head width is broader (about 1.13 — 1.17 times) than the distance between the postoculars. Further, the eyes protrude slightly in the new species and the interocellar and postocular spines are generally longer than in *dimidiatus*.

The distinguishing characters of this new species are elucidated further in the key given below.

Described from a total of 104 specimens collected as follows:

Transvaal, Pretoria:

1 ♀ (—)	16-xii-1939,	J. C. Faure	on creeper in gum plantation.
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1 ♀ (—)	28-xii-1941,	do.	on tall, coarse, "blue-green" grass, not in flower, along water furrows.
3 ♀ (—)	20-ix-1942,	do.	on <i>Hyparrhenia auctus</i> (Stapf.) Stent.
3 ♀ (+)	March, 1947,	do.	on <i>Pennisetum clandestinum</i> Hochst.
6 ♂, 3 ♀ (+) & 1 ♀ (—)	9-xii-1945,	E. K. Hartwig	on lucern
10 ♂, 23 ♀ (+) & 19 ♀ (—)	13-ii-1946,	do.	on <i>Panicum maximum</i> Jacq.
1 ♀ (—)	16-ii-1947,	do.	on <i>Bignonia tweediana</i> Ldl.
1 ♀ (—)	12-iii-1947,	do.	on <i>Chloris virgata</i> Sw.
Bethal:			
2 ♂ & 5 ♀ (—)	11-i-1939,	W. Powell	on <i>Eragrostis</i> sp.
Kinross:			
1 ♀ (—)	10-i-1939,	W. Powell	on <i>Hyparrhenia hirta</i> (L.) Stapf.
Basutoland, Mamathes:			
1 ♀ (+)	14-i-1941,	C. Jacot-Guillarmod	on Spanish reed (?).
1 ♀ (+)	23-i-1941,	C. Jacot-Guillarmod	in dry leaves of large <i>Amaryllidaceae</i> .
1 ♂ & 3 ♀ (—)	Sept., 1941,	C. + A. Jacot-Guillarmod	in hollow, dry stems of Composites.
4 ♂, 2 ♀ (+) & 2 ♀ (—)	1-iii-1942,	C. + A. Jacot-Guillarmod	on <i>Crinum</i> .
9 ♀ (—)	18-ix-1942,	C. Jacot-Guillarmod	on dry stems of dahlia.
Natal, Newcastle:			
1 ♂	22-ii-1946,	J. C. Faure	on <i>Hyparrhenia</i> grass.

All these specimens are mounted on slides; (—) = apterous; (+) = macropterous.

*Bolothrips varius* sp.n.,

Fig. 18. ♀ holotype (apterous), head and prothorax.

*Pseudodendrothrips ficus* sp.n.,

Fig. 19. ♀ holotype, head and prothorax: the setae between the ommatidia omitted.

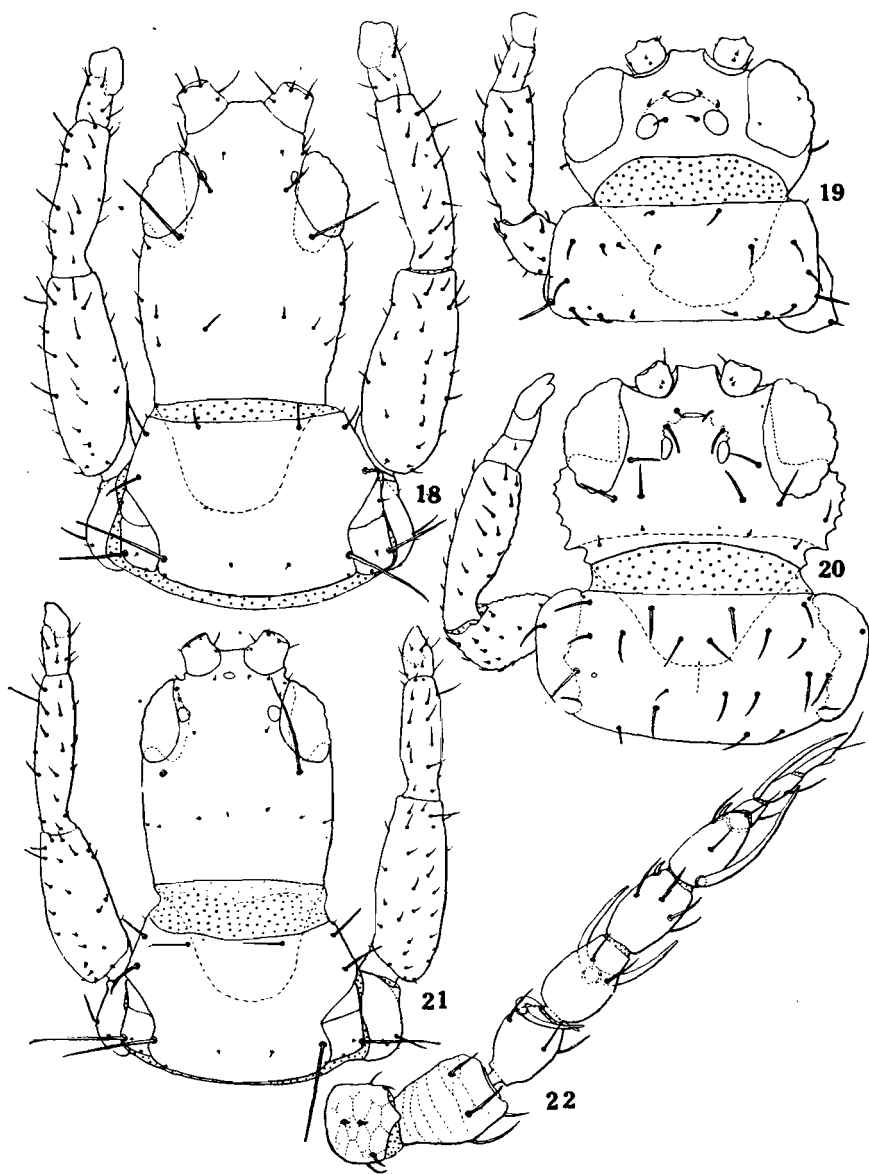
Fig. 22. ♀ paratype, left antenna

*Hercinothrips tenuis* sp.n.,

Fig. 20. ♀ holotype, head and prothorax.

*Bolothrips subulatus* sp.n.,

Fig. 21. ♀ holotype (macropterous), head and prothorax.



***Bolothrips varius* sp.n. (Figs. 16 and 18).**

*Female* (apterous). Length about 1.5 — 1.8 mm. (2.4 mm. distended). Colour: head, thorax and abdomen dark brown, legs paler, yellowish brown, the fore femora darkest on outer margin, slightly darker than the other femora and tibiae. Antennal segments i — iii yellowish brown, segment ii apically and iii in basal  $\frac{3}{4}$  (in some specimens wholly) paler and more yellow than remainder; segment iv paler brown than v — viii (in some specimens iv is as dark as v — viii), v — viii dark brown. Eyes yellow with red underlying tissue (when studied over black paper). All major spines and setae brownish yellow.

Head: about 1.30 — 1.47 times as long as wide, widest across the eyes, slightly narrower across the cheeks, becoming narrower towards base. Head width about  $169\mu$  at base as compared with about  $202\mu$  across eyes. Head produced before eyes. Head projection length about  $38\mu$ , width about  $108\mu$ . Eyes: scarcely protruding, coarsely faceted with about 6 facets on outer dorsal margin; interval about  $98\mu$ ; ventrally produced into a rounded point, ventral length varying from about equal to the dorsal length to about 1.4 times the dorsal eye length;\* dorsal length about  $84\mu$ , ventral length about  $106\mu$ . Ocelli: nearly always present although rudimentary, posterior pair about  $84\mu$  apart, and about  $54\mu$  from anterior ocellus. Anterior ocellus sometimes absent, e.g. in holotype. Postocular setae about  $63$  —  $84\mu$  in length, bluntly pointed but not knobbed, situated about  $7\mu$  from the eyes and about  $118$  —  $139\mu$  apart. Postocellar setae about  $12$  —  $42\mu$ . Ventrally a pair of setae about  $59$  —  $68\mu$  long, situated about  $12\mu$  from base of antennae and a posterior pair about  $62$  —  $72\mu$  long, about  $34\mu$  from anterior margin of mouth cone. Head with cheeks and posterior margin faintly sculptured. First abdominal tergite finely striate; rest of body practically without sculpturing.

Antennae (fig. 16): Sense cones: iii, 1 — 1; iv, 2 — 1; v, 1 — 1 (+ 1); vi, 1 — 0 (+ 1); vii, 0 — 1. Mouth cone: length from dorsal posterior margin of head about  $125\mu$ ; maxillary palpi: total length about  $47\mu$ ; ii about  $32$  —  $38\mu$ .

Prothorax: about 0.54 — 0.59 times as long as head and about 1.90 — 2.05 times as wide (including the coxae) as long. Major setae: antero-angulars about  $30$  —  $43\mu$ ; antero-marginals rudimentary to about  $34\mu$ ; mid-laterals about  $30$  —  $50\mu$ ; epimerals about  $46$  —  $65\mu$ ; postero-marginals about  $72$  —  $84\mu$ ; coxals about  $21$  —  $38\mu$ . All the larger setae bluntly pointed. Pterothorax about 0.90 — 0.95 times broader than prothorax (including the coxae). Legs normal, fore tarsi unarmed.

Abdomen: about 1.66 times as wide as length of head; tube about 0.57 — 0.60 times as long as the head, its length about 1.90 —

\* This variation in the ventral length of the eyes is not due to the position in which the insects are mounted on the slides.

1.95 times its basal width, the basal width about twice the apical width, sides parallel in basal seventh, thence sloping evenly to apex; terminal tube setae about 131 — 143 $\mu$  long. Longest setae on ixth abdominal segment about 114 — 131 $\mu$  long. Tube length about 160 — 170 $\mu$ .

*Measurements of holotype* (apterous female, Transvaal, Pretoria, 13-ii-1946, on *Panicum maximum* Jacq.) in  $\mu$ . Length 2,070 (distended); head: total length 288, width across eyes 199, behind eyes 197, at base 168. Head projection length 42, width 113. Setae: postocular 80, interval 122; distance between postocellars 38. Prothorax: length 169, width (including the coxae) 296; setae: epimeral 63; coxal 25; postero-marginal 80; mid-lateral 37; antero-angular 33; antero-marginal 21. Pterothorax width 280. Abdomen: length 1,474 (distended), width 473; longest setae on segment ix: 123. Tube: length 164, width at base 87, at apex 43; longest setae 156.

Antenna: total length 505,

segments	i	ii	iii	iv	v	vi	vii	viii
length	46	62	82	77	75	65	46	38
width	46	36	33	34	32	30	22	13

*Male* (apterous). Length about 1,368 — 2,145 $\mu$ . Colour: abdomen with darker and paler portions more yellow in male than in female. Antero-marginal, latero-marginal and median thickenings prominent in prothorax. Prothorax relatively longer in male; mid-lateral setae longer, 40 — 50 $\mu$ ; postero-marginals, coxals and epimerals generally shorter than in female.

Fore femora and tibiae enlarged and tarsi armed with a tooth; the development however varying: femur length about 170 — 263 $\mu$ , width about 80 — 106 $\mu$ ; tibia length about 135 — 152 $\mu$ , width about 46 — 51 $\mu$ ; tarsus length about 75 — 80 $\mu$ , width about 29 — 33 $\mu$ , tooth length about 18 — 30 $\mu$ .

Tube length about 1.75 its basal width and about 0.56 the head length.

*Measurements of allotype* (apterous male, Transvaal, Pretoria, 13-ii-1946, on *Panicum maximum* Jacq.) in  $\mu$ . Length 1,726 (partly distended), head: total length 254, width across eyes 178, behind eyes 173, at base 158; head projection width 105, length 42. Setae: postocular 64, their interval 110; postocellar 38. Prothorax: width (including the coxae) 295, length 176; setae: epimeral 40; coxal 25; postero-marginal 63; mid-lateral 42; antero-angular 34; antero-marginal 34. Pterothorax width 275. Abdomen: length 1,095 (partly distended), width 358, longest setae on segment ix: 101. Tube: length 144, basal width 80, apical width 40.

Antenna: total length 442,

segments	i	ii	iii	iv	v	vi	vii	viii
length	42	47	64	63	64	57	42	34
width	46	34	31	32	32	30	22	13

The species most closely related to the new species can be separated as follows: *B. bicolor* (Heeger) differs in having the antennal segments iv — vi yellow basally and in the presence of 2 sense cones on segment iv. The head is 1.2 times as long as broad in *B. bicolor*. *B. fijiensis* Moulton has 4 sense cones on segment iv of the antenna and the eyes are not produced on the ventral surface of the head. *B. brachyurus* Bagnall has the head widest across the cheeks, the pteronotum width 1.56 times the head length, and the male with fore-tibia armed with a tooth at apex (as in fore-femora of *Heplandrothrips*). *B. cingulatus* (Karny) has the basal tube width almost 2.5 times the apical width; the antennae are stouter, about 1.5 times the head length. First and second abdominal segments are yellow in *B. cingulatus*. The distinguishing characters of this new species are elucidated further in the key given below.

Described from a total of 54 apterous specimens taken as follows:

Transvaal, Pretoria:

1♂	13-ii-1921,	J. C. Faure	(sweepnet).
1♂	23-xii-1945,	E. K. Hartwig	on <i>Hyparrhenia hirta</i> (L) Stapf.
8♂, 15♀	13-ii-1946,	do.	on <i>Panicum maximum</i> Jacq.
1♀	18-v-1947,	J. C. Faure	on <i>Pennisetum clandestinum</i> Hochst.

Bethal:

2♂	11-i-1939,	W. Powell	on <i>Eragrostis</i> sp. affinis <i>E. curvula</i> Nees.
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Natal, Newcastle:

7♂, 2♀	22-ii-1946,	J. C. Faure	on <i>Hyparrhenia</i> grass.
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Cape Province, Fishhoek:

1♂, 1♀	February, 1941,	J. C. Faure	on grass (reddish dense tufts on N. Slope of mountain).
1♀	February, 1941,	do.	on <i>Elegia juncea</i> (?) L.
6♀	8-xii-1943,	do.	on <i>Chondropetalum tectorum</i> Pillans.

Fort Cox:

1♀	29-iii-1938,	C. Jacot-Guillarmod	on <i>Gymnosporia nemerosa</i> (?) Syzsz.
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Basutoland, Mamathes:

1♂	23-i-1941,	C. Jacot-Guillarmod	in dry leaves of large <i>Amaryllidaceae</i> .
2♀	14-i-1940,	C. do.	in leaf sheaths of Spanish reed.
4♀	1-iii-1942,	C. + A. do.	on <i>Crinum</i> .

All specimens are mounted on slides.

***Bolothrips subulatus* sp.n. (Figs. 13 and 21).**

*Female* (macropterous). Length about 1.90 — 2.13 mm. Head, thorax and abdomen brown. Legs brown, a shade lighter than body, tarsi and fore tibiae palest. Eyes yellow with dark red underlying tissue, almost black in dark specimens (when studied over black paper). Antennae: i brown, ii brown basally, becoming paler (almost yellow) apically, iii yellow, iv brown, dark brown in basal third remainder paler, never as dark as segments v — viii; v — viii dark brown. Wings hyaline.

Head: about 1.15 — 1.25 times as long as wide, widest across the eyes, slightly narrower behind the eyes; cheeks becoming narrower towards base, broadest just behind eyes. Head width about 150 — 180 $\mu$  at base as compared with about 160 — 204 $\mu$  across the eyes. Head produced in front of eyes, extreme tip about 30 $\mu$  from line through anterior margin of eyes; distance from eye to margin of antennal insertion, about 8 — 12 $\mu$ . Eyes scarcely protruding, about eight facets on outer dorsal margin; interval about 92 — 101 $\mu$ . In specimens with heads not bent downwards the dorsal eye length about equal to the ventral eye length. Eyes produced ventrally into a blunt point. Ocelli present, about 12 $\mu$  in diameter. Posterior pair about 75 $\mu$  apart and interval between posterior and anterior ocelli about 46 $\mu$ . Postoculars about 50 — 100 $\mu$  in length, about 123 — 135 $\mu$  apart, pointed, situated about 10 $\mu$  from eyes. Postocellar setae rudimentary. Ventrally a pair of setae about 50 — 84 $\mu$  long, situated about 4 — 12 $\mu$  from the base of antennae and a pair about 42 — 70 $\mu$  in length, about 16 $\mu$  from anterior margin of mouth cone. Head with cheeks very faintly sculptured. First abdominal tergite with reticulations. Tergum of mesothorax finely transversely striate.

Antennae (fig. 13): sense cones: iii, 1 — 1; iv, 2 — 1; v, 1 — 1 (+ 1); vi, 1 — 0 (+ 1); vii, 1 on dorsum. Mouth cone: length from dorsal posterior margin of head about 114 $\mu$ ; maxillary palpi: total length about 58 $\mu$ ; ii about 38 — 44 $\mu$ .

Prothorax: about 0.58 times as long as the head and about 2.16 times as wide (including the coxae) as long. Major setae in  $\mu$ : Antero-angulars about 21 — 42; antero-marginals about 20 — 40; mid-laterals about 30 — 64; epimerals about 60 — 105; postero-marginals about 63 — 114; coxals about 20 — 40; all setae bluntly pointed. Pterothorax about 1.075 times broader than prothorax (including the coxae). Legs normal, fore tarsi unarmed. Wings: not noticeably constricted in middle, the width broadest near base, about 80 — 90 $\mu$ , length about 800 — 900 $\mu$ . Accessory fringe setae about 6 — 10 in number. Subbasal wing setae usually two in number, i about 30 — 40 $\mu$ , ii about 50 — 80 $\mu$ .

Abdomen: width about twice the head length; the tube about 0.60 — 0.75 times as long as the head; its length about 1.7 — 2.0 times its basal width. The basal width about twice or slightly less than

twice the apical width; sides parallel in basal sixth, thence sloping evenly to apex; longest tube setae about 147 — 170 $\mu$ . Tube length about 150 — 180 $\mu$ . Longest setae on abdominal segment ix about 146 — 190 $\mu$ .

*Measurements of holotype* (macropterous female, Transvaal, Pretoria, 1-i-1946, on *Bignonia Tweediana* Ldl.) in  $\mu$ . Length 2,041 (partly distended); head: total length 224, width across eyes 183, behind eyes 180, at base 164. Head projection: length 30, width 98. Setae: postocular 99 long and 126 apart. Prothorax: length 131, width including coxae 281; setae: epimeral 90; coxal 30; postero-marginal 93; mid-lateral 46; antero-angular 40; antero-marginal 40. Pterothorax width 304. Abdomen: length 1,368 (partly distended), width 390; longest setae on ix: 177; tube: length 152, width at base 75, at apex 38; longest tube setae broken in holotype but measuring 148 in a paratype.

Antenna: total length 463,

segments	i	ii	iii	iv	v	vi	vii	viii
length	42	54	70	68	64	62	50	46
width	42	33	30	32	31	28	21	10

*Female* (deälated). Colour size and structure very similar to those of macropterous female. Ocelli present and well developed. Pterothorax about as wide as the prothorax including the coxae.

*Male* (deälated). Length about 1,536 — 1,915 $\mu$ . Colour as in female. Ocelli present and not rudimentary. Fore femora and tibiae enlarged and tarsi armed with a tooth; the development however varying: femur length about 152 — 240 $\mu$ , width about 67 — 93 $\mu$ ; tibia length about 143 — 148 $\mu$ , width about 33 — 43 $\mu$ ; tarsus length about 67 — 68 $\mu$ , width about 25 — 30 $\mu$ ; tooth length about 10 — 30 $\mu$ . Prothorax relatively longer in male. Tube length about 1.60 — 1.65 times its basal width and about 0.55 — 0.61 times the head length.

*Measurements of allotype* (deälated male, Transvaal, Pretoria, 16-ii-1947, on *Bignonia Tweediana* Ldl.) in  $\mu$ . Length 1,915. Head: total length 207, width across eyes 170, behind eyes 165, at base 152. Head projection: length 25, width 93. Postocular setae length 61, interval 110. Prothorax: length 152, width (including the coxae) 321. Setae: epimeral 63; coxal 30; postero-marginal 63; mid-lateral 34; antero-angular 25; antero-marginal 12. Pterothorax width 287. Abdomen: length 1,263 (distended), width 398, longest setae on segment ix 135. Tube: length 127, basal width 75, apical width 36.

Antenna: total length 420,

segments	i	ii	iii	iv	v	vi	vii	viii
length	46	55	68	59	63	52	42	38
width	42	29	29	29	29	27	21	10

The species most closely related to the new species can be separated as follows: *B. bicolor* (Heeger) differs in having the



antennal segments iv — vi yellow basally, and 2 sense cones on segment iv. *B. fijiensis* Moulton has 4 sense cones on segment iv of the antenna and the wings noticeably narrowed in the middle. *B. brachyurus* Bagnall has the head widest across the cheeks, the pteronotum width about 1.56 the head length, and the male with the fore-tibia armed with a tooth at apex (as in fore-femora of *Hoplandrothrips*).

*B. cingulatus* (Karny) has the basal tube width almost 2.5 times the apical width; antennae stouter, about 1.5 times the length of the head; first and second abdominal segments yellow. *B. varius* sp.n. is also closely related to the new species but can be separated by the relatively longer head as compared with the width; the longer head projection; the stouter eighth antennal segment; the post-ocellars about 12 — 42 $\mu$  in length and the longest setae on segment ix of the abdomen never as long as the tube length.

The distinguishing characters of this species are elucidated further in the key given below.

Described from a total of 51 specimens taken as follows:

Transvaal; Pretoria:

1♂, 15♀ (—)	6-i-1940,	J. C. Faure	on bean foliage attacked by rust and mites.
1♀ (—)	8-vii-1943,	do.	on <i>Cryptolepis transvaalensis</i> Harv.
1♂	23-xii-1945,	E. K. Hartwig	on <i>Hyparrhenia hirta</i> (L) Stapf.
1♂, 16♀ (—) & 5♀ (+)	1-i-1946,	do.	on <i>Bignonia Tweediana</i> Ldl.
2♂, 4♀ (—) & 3♀ (+)	16-ii-1947,	do.	do.
1♀ (—)	7-ix-1947,	do.	do.

Portuguese East Africa, Lourenco Marques:

1♀ (+)	1-vii-1936,	J. C. Faure	on <i>Urorhloa</i> sp. (?)
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All the specimens are mounted on slides. (—) = deälated,  
(+) = macropterous.

**KEY TO SEPARATE THE THREE NEW SPECIES OF BOLOTHRIPS FROM THE PREVIOUSLY DESCRIBED SPECIES OF THE GENUS.\***

1. Head length 140 — 295 $\mu$ .....	2.
— Head length 295 — 410 $\mu$ .....	18.

\* Many descriptions of species included in this key were based on measurements of one specimen only. Often only measurements of females were given. It is therefore safer to use measurements of females in the key. Where measurements fall near the limits of the ranges given and where more than one specimen of the same species is available, averages of measurements should be used rather than measurements of single specimens. Possible variation in measurements of the given characters were taken into consideration when this key was drawn up so that the ranges given are not strictly based on the measurements given in the descriptions only.

2. Of the prothoracic setae the mid-laterals longest, about  $133\mu$  ..... *biformis* Moulton.
- Of the prothoracic setae the mid-laterals not longest, never  $133\mu$  ..... 3.
3. Postocular bristles about  $133\mu$  long, much longer than the eye ..... *nigra* Moulton.
- Postoculars less than  $133\mu$  long, shorter or not much longer than the eye ..... 4.
4. Epimerals of the prothorax 1.4 — 3.5 times longer than the postero-marginals, about  $73 - 140\mu$  long ..... 14.
- Epimerals 0.60 — 1.38 times longer than the postero-marginals, about  $32 - 72\mu$  long ..... 5.
5. Head longer than wide ..... 6.
- Head as wide as long or wider than long ..... 12.
6. Male with a short, longseated, sharply defined tooth at apex within on fore tibia, similar to teeth on apices of fore femora within the genus *Hoplandrothrips* ..... *pratensis* Hood.
- Male with fore tibia not armed ..... 7.
7. Segment iv of antenna with two sense cones ..... *bicolor* (Heeger).
- Segment iv of antenna with more than two sense cones ..... 8.
8. Segment iv of antenna with four sense cones ..... *fijiensis* Moulton.
- Segment iv of antenna with three sense cones ..... 9.
9. Antenna about 1.5 times the head length ..... *cingulatus* Karny\*
- Antenna about 1.7 — 2.1 times the head length ..... 10.
10. Head length about 1.3—1.5 times head width, postocellars developed, about  $12 - 42\mu$  ..... *varius* sp.n.
- Head length about 1.15 — 1.28 times the width, postocellars minute, about  $8\mu$  ..... 11.
11. Eighth antennal segment stout, length about  $32\mu$ , width about  $12\mu$ . The prothorax and legs yellow ..... *cinctus* Faure.\*\*
- Eighth antennal segment slender, length about  $46$ , width about  $10\mu$ . The prothorax and legs brown ..... *subulatus* sp.n.
12. Tube about  $100\mu$  long and about 0.56 times the length of the head ..... *embotyi* Faure.\*\*
- Tube about  $130 - 160\mu$  long and about 0.64 — 0.75 times the length of the head ..... 13.
13. Head broadest across the cheeks; basal head width about as wide as postocular spines are apart ..... *dimidiatus* (Hood)\*
- Head broadest across the eyes; basal head width broader than the distance between the postocular spines ..... *similis* sp.n.
14. Tube length  $240 - 250$  width about  $130\mu$ ; postoculars  $100 - 110\mu$  long ..... *marshalli* Priesner.
- Tube  $165 - 220\mu$  long,  $70 - 15\mu$  wide; postoculars  $50 - 94\mu$  long ..... 15.
15. Head  $280 - 295\mu$  long ..... *pratensis* Hood.
- Head  $240 - 260\mu$  long ..... 16.
16. Tube length  $190 - 212$ , width  $120 - 124\mu$  ..... *hilaris* Priesner.
- Tube length about  $176$  width about  $73 - 88\mu$  ..... 17.

\* Identified specimens of these species in the collection of the University of Pretoria were compared with the new species.

\*\* The holotype and paratype of *cinctus* as well as the holotype, allotype and paratypes of *embotyi* are in the collection of the University of Pretoria and were compared with the new species.

17. Postocular bristles about  $93\mu$  long ..... *semiflavus* Moulton.
- Postocular bristles about  $60\mu$  long ..... *artocarpi* Moulton.
18. Head length 295 —  $360\mu$  ..... 19.
- Head length 380 —  $410\mu$  ..... *litoreus* Hood.
19. Tube about 1.5 times as long as wide ..... *pratensis* Hood.
- Tube 1.8 — 2.8 times as long as width ..... 20.
20. Tube 1.8 — 2.0 seldom 2.1 times as long as wide ..... 21.
- [if 2.1 times as long as wide and tube length about  $210\mu$  then compare with *icarus* (Uzel)\*, *icarus* f. *pallipes* (Uzel)\*, *icarus* var. *tuberculatus* (Priesner)].
- Tube 2.2 — 2.8 times as long as wide ..... 22.
21. Tube length about 190, head length about  $300\mu$  ..... *brachyurus* (Bagnall).
- Tube length about 260, head length about  $348\mu$  ..... *gilvipes* (Hood).
22. Basal tube width about  $80\mu$  ..... *fijiensis* Moulton.
- Basal tube width 99 —  $118\mu$  ..... 23.
23. Greatest head width about  $287\mu$  ..... 24.
- Greatest head width 200 —  $230\mu$  ..... *badius* (Hood).\*
24. Male without fore tibia armed at apex ..... *dentipes* (Reuter).\*
- Male with fore tibia armed with a well developed sharp tooth at apex ..... *dentipes* var. *bagnalli* (Karny).

***Pseudodendrothrips ficus* sp.n. (Figs 19 and 22).**

*Female.* To the naked eye, the living insect shows the thorax brightly orange to pale orange and the abdomen yellowish-white. Under the microscope the head dorsally, antennal segments iv—viii and abdomen brownish yellow. Anterior margin of head between and behind the antennae shaded with brown, slightly darker than the head dorsally. Antenna i — iii yellowish brown, of the same shade as the anterior margin of the head. Eyes yellow with red underlying pigment (when studied over black paper). Ocelli with reddish, sometimes orange pigment. Pro- and pterothorax orange-brown, the prothorax sometimes brighter. In some specimens the prothorax is yellowish brown and the pterothorax brownish yellow.

The first two pairs of legs banded with alternating darker and paler areas. The fore femora and tibiae mostly with apical margin and median portion shaded with brown, the femora basally, and the tibiae near the joints, yellow. All tarsi pale yellow with a brown spot apically. The hind legs yellow, without darker bands. Forewings grey, the basal portion paler. Hindwings: pale, of the same shade as the basal portion of the fore wing; a dark longitudinal line runs medially from about the basal tenth to the apical twentieth of the wing. All fringe hairs brown. Abdomen: terga: brown; iii to viii with a dark anterior transverse line in middle third of each tergum; setae situated on terga, brown. Segment ix with the thinner second pair of spines pale brown; the remaining stouter spines on segment ix and the pair on segment x brown.

Length about 947 —  $1,053\mu$ . Head about 2.3 times as broad as long, bulging laterally. Eyes prominent, protruding anteriorly, with about 7 — 9 setae between the ommatidia on the dorsal and lateral

surfaces; dorsal length about  $67\mu$ , ventral length about  $50\mu$ . Eye interval about  $72\mu$ . Ocelli about  $12\mu$  in diameter, situated on a more or less triangular elevation.

Distance between anterior and posterior ocelli about  $13\mu$ ; interval between posterior pair about  $28\mu$ ; the posterior ocelli about  $10\mu$  from the dorsal posterior margin of the head. Cheeks armed with a spine situated just behind the eyes. Head produced between the bases of the antennae, the projection about  $8\mu$  long as measured from a line drawn through anterior margin of eyes. On the antero-ventral head surface there are four strong spines about  $23\mu$  long. Antenna (fig. 22): segment vii divided into two segments by a slanting suture; the division of the seventh segment is very distinct in this species; segments iii and iv each with a long u-shaped sense cone; v with a very short sense cone on the apical outer margin; vi with a very long basal sense cone on the inner margin, almost attaining the apex of vii and a very short sense cone on the apical outer margin; vii with a long ventro-basal sense cone and a second sense cone as long as the first, situated on the outer basal extremity of second division of segment vii.

Mouth cone: rounded, about  $96\mu$  from the posterior margin of the head. Maxillary palpi with two segments, i about  $21\mu$  and ii about  $22\mu$ .

Prothorax: slightly longer than the head, transversely striate (seen after clearing in NaOH) about 2.5 times as broad as long; spines on posterior angles about  $25\mu$  long. Pterothorax about 1.3 times as broad as the prothorax. Fore femora armed with several stout spines on the antero-lateral and ventral surfaces. Hind legs: longer than the fore and middle pair; tibiae apically with one spine and tarsi with two; femur length about  $110\mu$ , width about  $30\mu$ ; tibia length about  $114\mu$ , width about  $29\mu$ ; tarsus very long, length about  $103\mu$ , width about  $17\mu$ .

Wings reaching the 8th abdominal segment. Fore wings: broad basally, becoming narrower apically, median vein with about 7 spines, those in apical portion of wing more widely spaced than the others; the fore margin with smaller curved spines between the longer fringe setae, the latter absent in the basal quarter and apical tenth of wing margin.

Abdomen: length about  $630\mu$ , about 1.35 times as broad as the head; terga: with two pairs of setae, the stouter antero-median pair, gradually becoming longer from segments i — viii, those on i about 14 to about  $50\mu$  in length on segment viii; and the second shorter pair more latero-posteriorly; tergum i in median area and ii — vii laterally with unequal angular reticulations; i antero-medially and postero-medially, ii — vii on posterior median margin, viii laterally and on the posterior margin, ix and x on posterior half with microtrichia. These microtrichia very indistinct, not tapering to a point as in *Scirtothrips* but more or less of equal thickness from base to apex, bases obscure.

Segments ix with five pairs of spines, 3 dorsal (the second pair from the middle of the tergum weakest), one lateral and one ventral pair measuring about 42, 30, 34, 21 and 21 $\mu$  respectively. The last abdominal segment with one pair of spines about 21 $\mu$  in length.

*Measurements of holotype* (female, Transvaal, Pretoria, 20-i-1946, on *Ficus Pretoriae* Burt-Davy) in  $\mu$ . Length 947. Head: length 67, width across eyes 156, behind eyes 152, at base 128. Length of cheek spine 14. Spines on antero-ventral head surface 23 long; lateral pair 76 and median pair 27 apart. Prothorax: length 68, width 169. Pterothorax width 225. Spine on distal tip of hind tibia 25 and tarsi 10 long. Fore wings: length 653, width in about middle 42. Abdomen: length 630, width 212, longest spines on segment ix 42, those on x 21.

Antenna: total length 202,

segments	i	ii	iii	iv	v	vi	vii	viii
length	21	32	30	30	27	28	21	15
width	23	25	20	20	17	13	8	4

*Male*. General colour pale yellow. Head, thorax, middle and hind legs and the abdomen pale yellow. Fore tibia shaded with brown medially and at the apex; remainder pale yellow. All the tarsi apically with a brown spot. Antennal segments i and ii almost white; segments iii to viii greyish-brown. Eyes yellow with red underlying pigment (when studied over black paper); ocelli with orange pigment. Fore wings much paler than in female, yellow, shaded very slightly with grey, basal portion not paler. Hind wing of same colour as fore wing with dark median longitudinal stria as in female. All fringe hairs brown. Spines on abdomen brownish-yellow.

Length about 653 $\mu$ . Head about twice as broad as long. Eyes: dorsal length about 64 $\mu$ , interval about 51 $\mu$ , ventral length about 50 $\mu$ . Ocelli about 12 $\mu$  in diameter. Distance between anterior and posterior ocelli about 12 $\mu$ ; interval between posterior pair about 21 $\mu$ ; the posterior ocelli about 8 $\mu$  from the dorsal posterior margin of the head. Head projection between the antenna about 6 $\mu$  from line drawn through anterior margin of eyes. Four spines on antero-ventral head surface about 14 $\mu$  long. Maxillary palpi: i, 21 $\mu$  and ii, 17 $\mu$  long.

Prothorax about twice as broad as long. Spine on posterior angles about 17 $\mu$  long. Wings longer than the abdomen. Abdomen: length about 358 $\mu$ , slightly narrower than the head. Segment ix with five pairs of spines; three dorsal (the pair nearest the middle of the tergum weakest), one lateral and one ventral, measuring about 26, 34, 30, 30 and 21 $\mu$ . The last abdominal segment with one pair of spines about 21 $\mu$  long.

*Measurements of allotype* (male, Transvaal, Pretoria, 20-i-1946, on *Ficus Pretoriae* Burt-Davy) in  $\mu$ . Length 653. Head: length 71,

width across eyes 139, behind eyes 131, at base 116. Length of cheek spine 8. Length of spines on antero-ventral head surface 16; lateral pair 61 and median pair 21 apart. Prothorax: length 73, width 140. Pterothorax width 194. Spine on distal tip of hind tibia 18 and tarsi 9 long. Fore wing: length 560, width in about middle 38. Abdomen: length 358, width 127, longest spines on segment ix 33, those on x 17.

Antenna: total length 190.

segments	i	ii	iii	iv	v	vi	vii	viii
length	17	26	27	30	30	26	22	10
width	21	23	17	17	16	13	8	4

This new species is the first *Pseudodendrothrips* described from South Africa. It differs from *P. ornatissimus* Schmutz mainly in the antenna. *P. ornatissimus* has antennal segment ii twice the length of i; iii to vi about equal in length and vii longer than ii. The new species has ii about 1.5 times the length of i; iii — vi not equal in length and vii shorter than ii. *P. ornatissimus* also has only one spine at the apex of the hind tarsi and the tenth abdominal segment has a few short hairs. In the new species the hind tarsus is armed apically with two short spines and the tenth abdominal segment has two stout, strongly sclerotised spines. *P. mori* (Niwa) is very much paler than the new species, has the head 1.9 times as broad as long, and the prothorax 1.7 times as broad as long. The new species has the head 2.3 times as broad as long and the prothorax 2.5 times as broad as long.

Described from a total of 46 females and one male collected in Pretoria, 20-i-1946 (E. K. Hartwig) on *Ficus Pretoriae* Burrt-Davy. These specimens are all mounted on slides in Canada Balsam. Two identified specimens of *P. mori* in the collection of the University of Pretoria were compared with the new species.

### ***Hercinothrips tenuis* sp.n. (Figs. 11 and 20).**

*Female* (macropterous). Length about 1,200 $\mu$  (distended about 1,390 $\mu$ ). The head, thorax and abdomen dark, rich brown. All femora brown with narrow yellow apices and bases; all tibiae brown medially, yellow apically and basally, the middle tibiae darkest; all tarsi yellow. Fore wing with two brown crossbands; the first about 1/5 — 1/4 of wing length; the pale interval about as long as first cross-band, situated in about the middle of the wing. Wing setae on dark cross-bands and at wing tip dark brown, pale yellowish in light areas. Antenna with segments iii — v yellow; i and ii shaded very lightly with brown; vi pale yellowish brown, yellow at extreme base; vii and viii light brown.

Head about 1.6 — 1.7 times as wide as long, about 1.02 — 1.10 times as wide across cheeks as across eyes; cheeks with a prominent bulge; base of head with usual necklike constriction; dorsal pattern of reticulation typical of the genus, the lines of sculpture heavy and

nearly black and the reticles themselves devoid of minute wrinkles. Eyes: rounded, about 0.65 times the head length and about 0.6 times as wide as their dorsal interval; dorsal length about  $80\mu$ , dorsal width about  $48\mu$  and dorsal interval about  $88\mu$ ; ventral length about  $56\mu$ , ventral width about  $42\mu$  and ventral interval about  $101\mu$ . Ocelli: borne on the usual prominence, about  $16\mu$  in diameter, the posterior pair about 30 microns apart and about  $17\mu$  from median ocellus. Antenna (fig. 11) about 2.3 — 2.6 times as long as the head; about 1.45 times as long as width across cheeks and about 1.55 times as long as width across eyes. Segment viii about 5.6 times as long as wide; segments iii and iv with forked trichomes large and U-shaped, that on iv extending to about middle of segment v. The other sense cones simple.

Prothorax: shorter than head, about 0.85 — 0.90 times the length of the head; about 2.0 — 2.3 times as wide as median length; with the usual deep transverse groove near posterior margin marked behind by a heavy sclerotised line; reticles not as sharply defined as on head, those on middle of prothorax not evanescent; setae pale and stout, the longest about  $25\mu$ . Pterothorax about 1.3 times as wide as prothorax. Fore wings; about  $800 - 840\mu$  long and about  $55\mu$  wide at middle; costal margin with about 24 — 26 strong setae (those at middle of wing about  $46 - 54\mu$  long) and about 32 — 36 fringing hairs; anterior vein with a basal group of about 6 setae, followed by about 12 setae; posterior vein with about 10 setae, those at the middle of wing on both veins about  $38\mu$  long. Legs typical of the genus.

Abdomen: reticulation present on terga i — ix but much weaker than on head, absent on the posterior median margin of terga ii — viii, these areas roughly semicircular; abdominal terga ii — v laterally provided with microtrichia, otherwise sculpture and chaetotaxy about as in *H. bicinctus* (Bagnall); seta i on ix about  $80\mu$ , ii about  $83\mu$  and iii about  $64\mu$ ; seta i on x about  $75 - 80\mu$  and ii about  $47 - 50\mu$ .

*Measurements of female* (holotype, Transvaal, Pretoria, 12-ii-1947, on *Rhamnus prinoides* L'Her) in  $\mu$ . Length 1,390 (distended). Head: length 127, width across eyes 185, across cheeks 190, least width just behind eyes 173, least width at base 144. Prothorax: median length of pronotum 101, greatest width 216; mesothorax: width across anterior angles 236, greatest width 278, metathorax width of posterior part 258. Abdomen: greatest width (at segment iv) 315.

Antenna: total length 291,

segments	i	ii	iii	iv	v	vi	vii	viii
length	25	38	68	51	38	30	13	30
width	25	30	25	25	25	21	9	5

*Male* (macropterous). Length about  $1,000\mu$ . Colour almost as in female but with abdominal segments 3 — 8 paler, brownish-

yellow; legs wholly yellow or with the femora slightly brownish. Antenna with segments i and ii paler than in female and with segments iii — v lightly shaded with brown apically.

Structure essentially as in female. Cheeks not as strongly dilated. Tergum ix armed with two pairs of strong, nearly black, thornlike setae arising from approximately, elevated dark tubercles, one pair directly behind and somewhat below the other; a smaller, paler third pair situated postero-laterally to these.

*Measurements of male* (allotype, Cape, Port St. Johns, 8-vi-1942, on *Toddalia Stayneri* Schonl.) in  $\mu$ . Length 989. Head: length 98, width across eyes 159, least width just behind eyes 148, greatest width across cheeks 162, least width in front of subbasal flange 148, width across flange 150, least width at base 126. Eyes: dorsal length 71, dorsal width 47, dorsal interval 67. Ocelli: diameter 13, interval between posterior pair 25, distance of posterior ocelli from median ocellus 16. Prothorax: median length of pronotum 84, width 185; mesothorax: width across anterior angles 203, greatest width 241; metathorax: width of posterior part about 211. Fore wings: length 673, width at middle 51. Abdomen: greatest width (at segment ii) 207.

Antenna: total length 254,

segments	i	ii	iii	iv	v	vi	vii	viii
length	17	35	60	46	30	22	12	29
width	21	27	25	26	23	20	9	5

*H. brunneus* Hood\* is the species most closely related to the new species, but differs in having the head across the cheeks about 0.98 — 1.02 times as wide as across the eyes in the females. Females of the new species have the head width across the cheeks about 1.02 — 1.10 times as wide as across the eyes. The ratio "head: width across cheeks/width across eyes" in the males varies from about 0.99 to 1.01 in *H. brunneus* and from about 1.01 to 1.05 in the new species. The eyes of *H. brunneus* are relatively narrower as compared with the width of the head across the eyes so that in females the interval in *H. brunneus* is about 97 — 110 $\mu$  while the eye interval of the new species is about 84 — 92 $\mu$ . *H. brunneus* males have an eye interval of about 80 — 97 $\mu$  and males of the new species an interval of about 70 — 76 $\mu$ . *H. brunneus* further differs by the antenna being about 1.6 times as long as the head width and the head about 1.5 times as broad as long. In *H. bicinctus* Bagnall\* and *H. femoralis* (Reuter)\* the head width across the cheeks is about 1.4 — 1.5 times the head length; antennal segments: length (width) iii, 73 — 80 (21 — 24); viii, 34 — 43 (4)  $\mu$  as compared with the head width across the cheeks about 1.6 — 1.7 times the head length and relatively shorter antennal segments iii and viii in the new

\* Identified specimens of this species in the collection of the University of Pretoria were compared with the new species.



species. Further *H. bicinctus* has the first and second dark cross-bands of the fore wing only  $1/8$  and  $1/7$  of the wing length and *H. femoralis* has the fore wings without a median paler cross-band.

*H. pattersoni* (Bgn.) has the third antennal segment more than three times as long as wide; the prothorax more than 2.5 times as wide as long; the prothorax length about 0.75 times the head length and the antenna about 2.8 times the length of the head. In the new species the third antennal segment is about 2.6 times as long as wide; the prothorax less than 2.3 times as broad as long; the prothorax length about 0.9 times the head length and the length of the antenna about 2.3 — 2.6 times the head length. *H. dimidiatus* Hood\* has the head, prothorax and pterothorax yellow, always abruptly paler than the abdomen and the costa of the fore wings with 20 — 22 strong setae and 25 fringing hairs. The new species further differs from *H. dimidiatus* in the sense cone on the third antennal segment being U- instead of Y-shaped and in the presence of microtrichia on the second to fifth abdominal terga only.

Described from a total of 24 specimens all of which have been mounted on slides in Canada Balsam collected as follows:

Cape, Port St. Johns:

4♀	30-v-1942,	J. C. Faure	on <i>Turraea floribunda</i> Hochst.
2♂, 2♀	8-vi-1942,	do.	on <i>Toddalia stayneri</i> Schonl.
3♀	11-vi-1942,	do.	on <i>Cynanchum ellipticum</i> (Marv.) Dyer.

Zululand, Richards Bay:

1♀	1-vi-1943,	J. C. Faure	on dead branches.
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Transvaal, Pretoria:

12♀	12-ii-1947,	E. K. Hartwig	on <i>Rhamnus prinoides</i> L'Her.
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All the specimens, discussed under the following species, have been mounted on slides in Canada Balsam.

***Aeolothrips brevicornis* Bagnall. 1915, Ann. Mag. Nat. Hist., Ser. 8, XV, p. 317.**

Sixteen males and 27 females collected by the writer at Stellenbosch, Cape (10-x-1946) on *Lolium multiflorum* Lam. The colour of the third antennal segment in this series of specimens varies from abruptly clear yellow, with a dark-brown circle at apex, to totally yellowish-brown. The lengths (widths) of antennal segments iii, iv, v and the style (vi — ix) were measured on all these specimens and the measurements varied as follows: iii, males 67 — 84 (21 — 23), females 76 — 101 (21 — 25); iv, males 63 — 72 (21 — 23), females

\* Identified specimens of this species in the collection of the University of Pretoria were compared with the new species.

59 — 92 (21 — 25); v, males 59 — 72 (21 — 23), females 50 — 80 (21 — 25) and the style 38 — 47 in the males, females 42 — 67. The segments of the style further vary from closely joined to clearly separated and their sides vary from straight to rounded.

From the above mentioned measurements, characters and the comparison of these specimens with the brief published descriptions of *A. brevicornis* Bagnall, *A. brevicornis* var. *fuscus* Moulton and *A. africanus* Moulton, it seems as if these three forms may belong to one species.

One male and one female collected by Professor Faure at Vereeniging, Transvaal (10-xii-1918) in flowers of *Tagetes minuta* and identified by Dr. J. D. Hood as *A. brevicornis*, in the collection of the University of Pretoria were also compared with the writer's series.

Before final conclusions can be arrived at on the relationships of the forms *A. brevicornis*, *A. brevicornis* var. *fuscus* and *A. africanus* it will be essential to examine the types and to collect further series of specimens from various localities.

**Bolothrips dimidiatus** (Hood) (Figs. 15 and 17). 1918 (= **Cryptothrips dimidiatus** Hood). Mem. Queensland Mus., VI, pp. 142, 145.

The specimens collected in the Cape compare well with Hoods description of the Australian specimens, with the exception that the antennae in the South African specimens seem more swollen. One male and 46 females collected by the writer at Stellenbosch, Cape (10-x-1946) on *Avena fatua* L.; 10 males and 30 females taken at Fishhoek, Cape (5-xii-1946) on dead stems of *Cyperus* and 3 females collected at Hermanus, Cape (30-i-1947) on grass by Professor Faure.

**Chirothrips hoodi** Jacot-Guillarmod. 1941, Jour. Ent. Soc. S. Afr., 4, p. 80.

The writer's series agrees very well with one female paratype in the collection of the University of Pretoria and with the description; the character of the simple outer sense cone of segment iv, which is sufficient to separate this species from the closely related *C. aculeatus* Bagnall and *C. meridionalis* Bagnall, appears to be constant. Six males and 18 females collected by the writer at Pretoria, Transvaal (23-xii-1945) on *Hyparrhenia hirta* (L.) Stapf.

**Elaphrothrips édouardi** Jacot-Guillarmod. 1939, Jour. Ent. Soc. S. Afr., 2, p. 46.

The series collected agrees in colour and structure with two male and two female paratypes, as well as with the description of *E. édouardi* Jacot-Guillarmod.

One female\* (+) (20-xii-1945) on *Prunus cerasifera* var. *Pissar-*

\* (+) = macropterous. (—) = brachypterous.

*dii* Koehne; 1 female (—) (29-xii-1945) on *Mundulea suberosa* Bth.; 2 females (+) and 1 female (—) (1-i-1946) on *Bignonia Tweediana* Ldl.; 1 male, 11 females (+) and 11 females (—) (13-i-1946) on *Lannea discolor* Sond.; 1 female (+) and 6 females (—) (20-i-1946) on *Ficus Pretoriae* Burt-Davy.; 4 males, 1 female (+) and 5 females (—) (11-v-1946) on *Mundulea suberosa* Bth.; 3 males and 2 females (—) in dry *Cassia* seedpods. All these specimens were collected by the writer at Pretoria, Transvaal.

**Limothrips cerealium** (Haliday). 1796. See "Die Thysanopteren Europas" by Priesner, p. 150, for complete references up to 1925.

Thirty-nine males and 125 females collected by the writer (10-x-1946) on *Lolium multiflorum* Lam. and 6 males and 13 females collected by Mr. H. P. van Heerden (6-xi-1947) on small grains, at Stellenbosch, Cape. These specimens were compared with a large series of specimens of *L. cerealium* kindly collected by Dr. C. B. Williams on wheat at Harpenden, England (30-vii-1947).

This appears to be the first time that this species has been recorded from South Africa. Apparently it does not cause sufficient damage to attract attention as a pest in this country.

**Liothrips gymnosporiae** Priesner. 1936, Bull. Soc. Roy. Ent. Egypte, 20, p. 98.

Twelve males and 23 females (27-xii-1945) on *Gymnosporia burxifolia* L.; 1 female (22-xii-1945) on *Combretum zeyheri* Sond.; 2 females (13-i-1946) on *Lannea discolor* Sond.; 1 male and 1 female (20-i-1946) on *Dichrostachys glomerata* (Forsk.) Chiov.; 2 females (20-i-1946) on *Ficus Pretoriae* Burt-Davy.; all these specimens were collected by the writer at Pretoria.

**Phibalothrips peringueyi** (Faure). 1925 (= **Reticulothrips peringueyi** Faure). S. Afr. Journ. Nat. Hist., V, p. 145, Pl. XIV, figs. 5, 7—11.

One male and 8 females (23-xii-1945) were collected by the writer on *Hyparrhenia hirta* (L.) Stapf. at Pretoria.

**Retithrips aegyptiacus** Marchal. 1910, Bull. Soc. Ent. Egypte, 3, pp. 17—20.

Three males and 7 females (5-ii-1947) were collected by the writer on *Combretum zeyheri* Sond. at Pretoria.

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